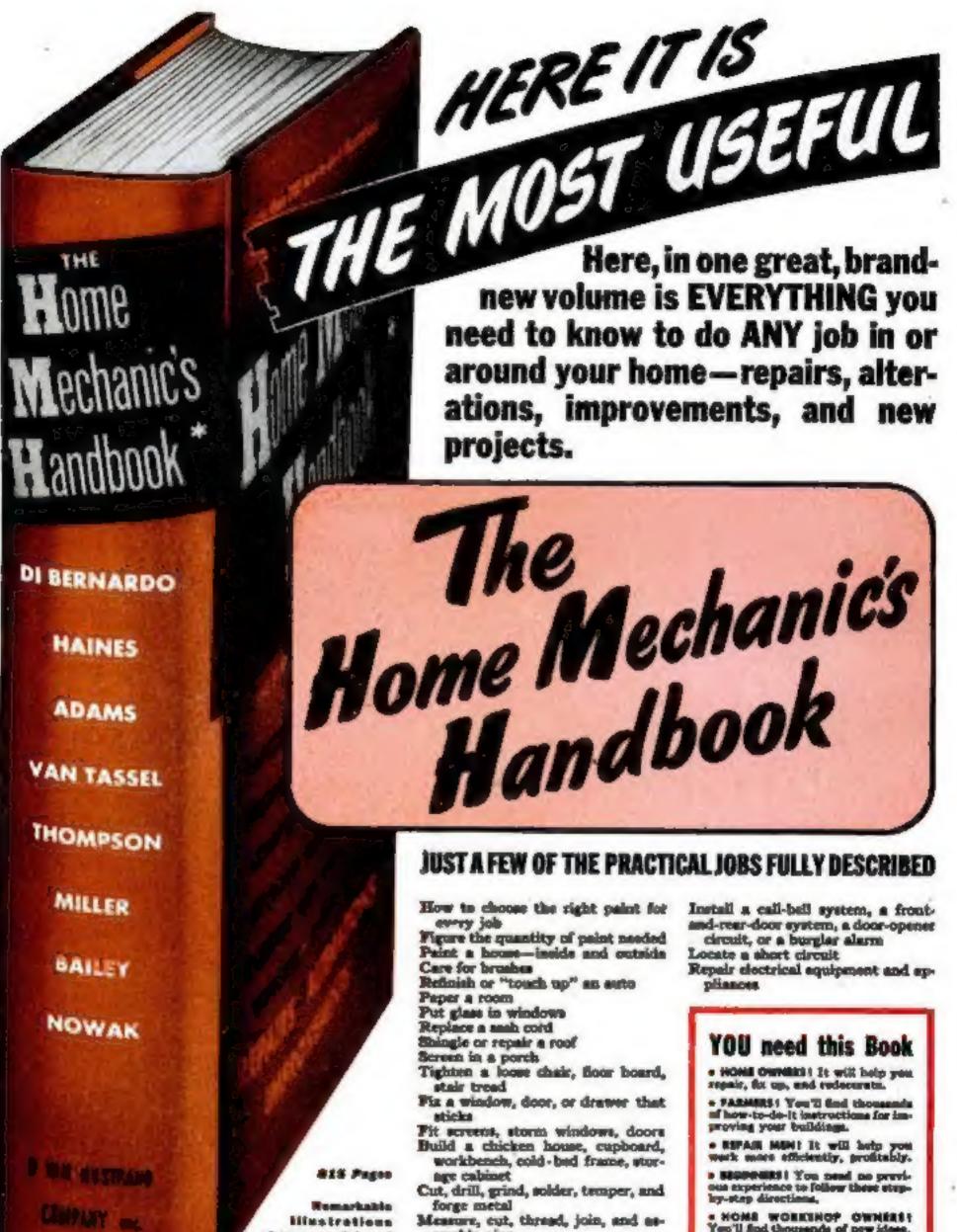


SEPT 25¢ Newest "Amphibs" for Invading Japan . . . Page 121

WHAT RADAR IS-HOW IT WORKS-P.65



BIG ... AUTHORITATIVE ... TREMENDOUSLY HELPFUL

show every job and

the use of every tool

JUST A FEW OF THE PRACTICAL JOBS FULLY DESCRIBED

semble pipe

Fix leaks in fasseets and valves

Thew frozen pipes

Install a hot-water heater Make a flagstone walk, a sidewalk,

a wall, concrete steps, a shuffleboard

Build a brick fireplace Install glass blocks

Install a call-bell system, a frontand-rear-door system, a door-opener circuit, or a burgler alarm

Locate a short circuit

Repair electrical equipment and ap-

YOU need this Book

- HOME OWNERS I It will help you repair, fix up, and redocurate.
- of how-to-do-it instructions for improving your buildings.
- REPAIR MENT It will help you work more efficiently, profitably.
- sappears: You need no previous experience to follow these step-ley-step directions.
- HOME WORKSHOP OWNERS: You'll find thousands of new idees, "kinks," practical projects.
- HOSSYSTS! You'll get a great leick out of the handreds of "tricks of the trade," ingusieus abort cuts, helpful hints.
- · EX-DESIGN MINI You'V fact it of great help in remodeling a house, a farm, a place of business.

Caynamal special

P77C-LS3-4PSG

BOOK YOU'LL EVER OWN!

COMPLETE INFORMATION ON EVERY PRACTICAL TRADE

The book every home owner has dreamed of

Turn to this comprehensive HANDBOOK with confidence. You will find its helpful pages crammed with the latest, most efficient and workmanlike ways of doing every kind of job about the home and in the home workshop. Carpentry, metal work, electrical work, plumbing, masonry, painting and decorating—all explained by master craftsmen. The most detailed information about how to choose, repair, and apply the right materials in the right places.

Every move in the use of tools is shown by vivid hands-at-work photographs. All the important operations, and those "tricks of the trade" that play so great a part in good craftsmanship, are explained and made crystal clear by detailed step-by-step drawings. Complete directions, fully illustrated, for thousands of jobs, small and large—from fixing a broken window to installing a hot-water heater; from varnishing a chair to painting a house.

PAINTING & DECORATING

Principles of paint soizing, formulas, and how to obtain any desired line. Pull directions for selection and care of trushes and other equipment. How to calculate amount of paint required, and best methods of applying to wood, metal, brick, concrete, stone, stucco, plaster. Exterior house painting-interior house paint-ing-choice of color schemes. Complete directions, fully illustrated, for obtaining decorative effects stippling, mottling, texturing, struciling, striping, etc. Methods of finishing with stain, shellac, varnish, and was. Proper stains for each variety of wood. Detailed step-by-step instructions for wall-papering. How to finish an auto, quickly, easily, and inexpensively.

WOODWORKING

The many varieties of wood and their relative merits, working qualities, and uses. Plywoods, vensers, and wood substituteshow to choose the materials best suited for the Job. Sizes, types and functions of all curpentry tools—how to use, sharpen, and adjust them. All the basic operations and processes of woodworking-everything from how to avoid warping to full directions for cutting each of the common joints. Wood turning—the different cuts, roughing, facing, sanding and finishing; drilling, boving, morticing, spinning, polishing. Hundreds of repair jobs and new constructions—inside and outside the house—are fully explained with diagrams and every practical fact you need to get the best results.

METAL WORKING

Complete information about the common metals, and the alloys wrought iron, cast iron, steel, German allver, pewter, the brasses and bronzes, solders and babbitts -when to use, how to use, and how to work them. Hand tools and machine tools—their specific purposes, sizes, and the most detailed inatructions for their use. Hints, ideas, and "tricks of the trade." How to use the engine laths. Metal jobs and projects for home and shop, complete with bill of material, equipment needed, and a fully illustrated account of every step in the work.

PLUMBING

The various kinds of pipe, pipe fittings, valves, had fatures. All the common plumbing tools -types, sizes, functions, and how to use them. How to cut, ream, thread, and assemble iron and brass pipe. How to connect copper tubing and make lead joints. The technique of pipe fitting, and the proper sequence of steps in assembling a piping system. House-hold plumbing projects—installing a hot-water heater, radiator, and various other units. How to drain a plumbing system when closing the house for the winter. How to fix leaks in faucets and valves, repair a faulty section of pipe. The cleaning, and maintensuce of each part of the plumbing system.

MASONRY

Answers every practical quastion about concrete, plastering, stucco, brick work, con-crete-block and glass-block construction, Describes all tools, and just how to use them. How to specify materials and estimate quantities. How to build forms; mix concrete, color it, make it watertight, finish it off; how to build walls, floors, steps. All the sure methods and special ways of working by which the master mason assures good results. Everything about plastering—from small re-pairs to doing entire rooms. Complete instructions for stuccoing reinforcing, methods of applying different costs, and how to obtain

> Kinds of brick—handling and laying. Mixing and coloring morter. Material charts. Types of construction. Various bonds. Forming cross joints. Fireplace construction. Working with concrete blocks-building the wall, corner construction. Kinds and sizes of glass blocks. Glass-block construction-morter, full-morter joints, set-in-wood construction.

> various decorative finishes.

ELECTRICAL WORK

Practical information about every electrical job the home mechanic may undertake around the house or in the home workshop. Principles of electricity—volta, amperes, ohms. Generation of electricity. Electrical energy and power. Puses and circuit breakers. Parallel and series circuits. Standard electrical symbols. Tools, materials, and requirements of National Electrical Code. Complete, fully Elustrated explanations of every step in various operations of general electrical work— aplicing, soldering, taping, testing, etc. In-stallation of various signalling systems—bella, bursers, and alarms. Wiring methods for power and lighting circuits. Complete projects for the home, such as BX wiring a room, and wiring a garage in conduit and BX. Portable appliances—fans, mixers, clocks, beaters, radios. Flund aquipment—oil burners, refrigerators, lighting plants, pumps, motors, generators, and control devices; all clearly described, with practical suggestions and hints for trouble shooting and adjustment.

Send No Money

Examine this Great Book FREE!

The coupon at the right will being you a copy of The Home Mechanic's Randbook for two days' examination, entirely free. Look it over, spend some time with it, and decids for yourself whether or not you want to keep it. Unless you are convinced that The Home Mechanic's Handbook is the most useful book you have ever seen, you may return it to us and owe nothing; or you may keep it by making a down payment of \$1.95, plus a few cents postage, and the balance in two monthly payments of \$2.00 each, (\$5.95 plus postage). But send in the coupon NOW! The supply is definitely limited.

Please and me a copy 10 days I will either rec- and \$1.00 a month for the (If you send the entire a	nc., Publishers, 250 fewith Avenue, New York 2, M. Y of THE HOME MECHANIC'S HANDBOOK. Within arts the book, or send you \$1.95, plus a few crosts postage amounts of \$5.95 with this coupon, we will pay the postage and refund guarantee if not completely satisfied.)
Hame	
Address	(Please priot)
Address	(Please pribt)

POPULAR SCIENCE

FOUNDED 1872

MONTHLY

VOL. 147 NO. 3

Mechanics & Handicraft

A TECHNICAL JOURNAL OF SCIENCE AND INDUSTRY

CONTENTS JOS SEPTEMBER, 1945

Cover: Painting by Frederic Tellander

News

How Radar Sees the Invisible	65
Modern GI's Fight in Body Armor	74
Annihilation Bomb-Friend or Foe?	80
Toilet Soap Kills Germs on Skin	82
Portable Artillery Has No Kick	84
Floating Shops Keep B-29's Aloft	90
Inside the World's Biggest Plane	94
He Draws with Scissors	100
Colonial Woodworking Shop	108
Evolution of the Machine Gun	118
Meet the LVT's: Beach Busters	121
Patents Tell Magicians' Secrets	126
A Flying Vacation (Part 2)	130

Automobiles

Gus Cures a War Headache	138
Auto Ideas	141
What's Coming in Convertibles	

Home and Workshop

Glass-Top Coffee Table	146
Wishing for a Well	152
Wood Carving in Low Relief	158
How to Go Aloft Safely	169
Aircraft Metals in the Home Shop	173
Who Says Portraits Are Difficult?	182
Trouble-Shooting A. C. Motors	191
Meet Hydrogen Peroxide	199
Closing Your Summer Cottage	



JAMES L. H. PECK (Page 55) has more than an academic interest in radar. He learned to fly in 1930 and was one of the first pilots to shoot down a modern German fighter. No stranger to Popular Science readers, he is widely known for his articles on aviation. He is now an officer in the U.S. Merchant Marine.

PUBLISHER Godfrey Hommand

ASSISTANT EDITOR . . . Fred O. Newman

AVIATION EDITOR C. B. Colby

HOME & WORKSHOP EDITOR . Harry Walton

EDITORIAL ASSOCIATES: Alden P. Armognac, B. T. Richards, Harry Samuels, Michale de Santis, Volta Terray, Frank Rowsome, Jr., Corl W. Bertsch, Ruth Westphal, Edward F. Alten, Devon Francis, Gold V. Sanders, James L. Freeman, R. P. Stevenson, Robert Gorman, Elsie E. Brandt,

ART ASSOCIATES: Stewart Rouse, William Patrick, Samuel Dukler, Frances Cooper.

PHOTOGRAPHY: W. W. Morris.

Pablished monthly at 350 Fourth Avenue, New York 10, N Y. by Popular Science Publishing to. Inc. Godfrey Hammond President and Treasurer: H. C. Wilson, Ray Keefer, Vire-Presidents: F. W. Briggs, Secretary. Entered as Second-class matter Dec. 28, 1918, at the Post Office of New York under the act of March I. 1870: additional entry as second-class matter at Dayton, Ohio, Entered as second-class matter at Dayton, Ohio, Entered as second-class matter at the Post Office Department, Canada, Printed in U.S.A. Copyright, 1945, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britato, and in all countries participating in the International Copyright Convention, Tearly subscriptions to United States and its possessions, \$2,30; Canada, \$3,00; foreign countries, excepting tanada, \$3,50. Subscribers must potify us of change of address four weeks in advance of the near publication date. He sure to give both old and new address.



Announcing a new, better synthetic rubber for tires

Another example of "building for today, testing for tomorrow"

B. F. Goodrich has announced that it is now making tires of a new kind of synthetic rubber, different from the synthetic rubber which is in general use by the tire industry.

The new rubber is a B. F. Goodrich development. Tires made of it give longer wear than those made of ordinary synthetic. They run cooler, which is especially important in big truck tires that often get hotter than boiling water under heavy loads on hot pavements.

The new rubber was actually developed months ago and made

in plants operated for the government by B. F. Goodrich. For a while it was used only in military tires, then in tires for heavy trucks. Now it is also going into new B. F. Goodrich tires for passenger cars. Tires containing it will stand up better under heat or under constant flexing, will weat longer, will even have more resistance to bruising or damage from accident. They'll also have more resistance to cracking, and they'll be able to stand higher speeds.

This new, better rubber, so important it was a military secret until recently, is one more example of constant development at B. F. Goodrich—the kind of improvement that will bring America far better products after the war than we ever had before. Yet it's only one of dozens of tire improvements made by B. F. Goodrich in the last few years. It's another indication that you get extra value, extra economy, whenever you buy a B. F. Goodrich tire. The B. F. Goodrich Company, Akron, O.

In war or peace

B.F. Goodrich

FIRST IN RUBBER

Crearp/tiel relieful

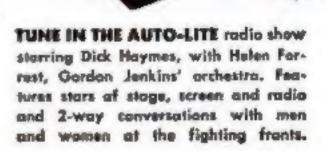


You can have the help of experts when you buy your next battery. Follow their example. They choose Auto-Lite batteries for service in the millionmile ocean-spanning Clippers, for service with our fighting buy an Auto-Lite battery-speciforces in jeeps, tanks, half-tracs fied as standard equipment by and other vehicles.

The qualities experts look for in a battery are the same you need in your car battery-long life, quick starts, dependable power and low-cost operation. That's what you get when you leading automotive engineers.

AUTO-LITE BATTERY CORPORATION + TOLEDO, 1, OHIO

Manufacturing Plants at: Riegers falls - Indianapolis - Atlants - Bakinni - Stinium City - Incole







The wire you see with the parachute on the end of it is a telephone wire, being payed out from a C-47 cargo plane.

Bell Telephone Laboratories, working with the Air Technical Service Command of the Army Air Forces, developed this idea. It will save precious lives and time on the battlefield.

A soldier throws out a parachute with the wire and a weight attached. The weight drops the line to the target area. From then on, through a tube thrust out of the doorway of the plane, the wire thrums out steadily—sixteen miles of it can be laid in 6 2/3 minutes. Isolated patrols can be linked quickly with headquarters. Jungles and mountain ranges

no longer need be obstacles to communication.

This is in sharp contrast to the old, dangerous way. The laying of wire through swamps and over mountains often meant the transporting of coils on the backs of men crawling through jungle vegetation, and in the line of sniper fire. It is reported that in one sector of the Asiatic theater alone, 41 men were killed or wounded in a single wire-laying mission.

Bell Telephone Laboratories is handling more than 1200 development projects for the Army and the Navy. When the war is over, the Laboratories goes back to its regular job helping the Bell System bring you the finest telephone service in the world;



BELL TELEPHONE LABORATORIES Exploring and inventing, devising

and perfecting for the Armed Forces at war and for continued improvements and economies in telephone service.

GOLD! BUT PEPSI-COLA IS ONLY A NICKEL O. SOCLOW

Coming Next Month

A COLORFUL LIFE is in store for you after the war. Homes, offices, and factories will blossom with all the bues of the rainbow as we apply new knowledge of the use of color for beauty, comfort, and safety. To help you share in this brightening-up process, Popular Science publishes a 14-page article, illustrated in color, on the scientific selection of paint shades for any given purpose.

A BUSINESS OF HIS OWN was what Salvator Salvatori wanted when he got his discharge from the Navy. Now he refurbishes old furniture, and fashionable New Yorkers are beating a path to his door. GI's who are looking forward to being their own bosses "after the duration" will be encouraged by the story of this enterprising veteran's success.

SEEING EYE OF ELECTRONICS. Are you up to date on the cathode-ray tube? Until recently only a scientific curiosity, it has found countless new uses under the stimulus of a mechanized war. John W. Campbell, Jr., tells how it works and describes the many kinds of jobs it will perform in the postwar world.

"LOST IN THE ARCTIC!" Those words, once so tragic, have been robbed of much of their terror for airmen who fly above the snowy wastes at the top of the world. Our flyers know that if they are forced down, the Arctic Search and Rescue Squadron will soon be out after them—with planes, sled-pulling huskies, even Saint Bernards. Read C. B. Colby's story of these good Samaritans of the snows.

NOW WE KNOW just how good the Germans' weapons were. Victory has given us the chance to clear up many wartime mysteries by examining and testing guns and vehicles alongside our own. There were many surprises in store for the Ordnance men who made these tests—and for P.S.M. readers who see the results in a comprehensive article next month.

MODEL HELICOPTER. You'll know a lot more about vertical-lift aircraft after building the "Skyhook" model belicopter from plans by Roy L. Clough, Jr. The author has eleverly met the problems that beset all builders of belicopters, big or little, to produce a model that is easy to build—and actually flies. THERE is a definite I.C.S. type. The records of 100,000 current students... more than 5 million students since 1891... supply the outlines. Here's how the typical enrollee shapes up at the time of beginning his studies:

He is an adult. In good times or bad times, he is an employed man. Circumstances have prevented his attending a college but he is ambitious, intelligent, determined to acquire the specialized training that will help him in his present job and prepare him for a better one.

Does the description fit you? Then you'll be interested in what I.C.S. helps these students to achieve. In a single 30-day period we have received as many as 635 student letters reporting advancement in salary and position. In a period of 120 days we have received 1,920 such reports.

Graduates include the presidents, board chairmen, chief engineers or chief chemists of some of the largest steel, airplane, chemical, railroad and electrical equipment companies in the country. Thousands of others have registered substantial successes in their chosen fields. Here's the kind of coupon they signed and mailed.

I. C. S. type of man?



INTERNATIONAL CORRESPONDENCE SCHOOLS BOX 7631-L, SCRANTON 1, PENNA. Without cost or obligation, please send me full particulars about the course before which I have marked X: Electrical Courses Electrical Drafting Electrical Engineering Power House Electric Practical Electrician Practical Telephony Telegraph Engineering Ship Drafting Ship Pitting Shop Practice Steel Mill Workste Tool Designing Welding, Gas and Electric Air Conditioning and D Textile Designing Wooles Manufecturing Plumbing Courses Air Conditioning Heating Refrigeration Steam Fitting Business and Accounting C Advertising C Advertising C Advertising C Advertising C Arithmetic C Bookkeeping D Business Management Cortified Public Accounting Commercial Cont Accounting Commercial Tax Peters Tax Prevalent Business and Chemistry Courses Chemistry Courses Chemistry, Analytical Chemistry, Industrial Chemistry, Mig. Iron & Steel Petroloum Refining | Plantin. Pulp and Paper Making Radio Courses. C Electronits Radio, General Radio Operating Radio Servicing Internal Combuggion Engines Courses Auto Technicias | Aviation | Diesel-Electric Diesel Engines | Gas Engines **Railroad Courses** Civil Engineering, Archi-tectural and Mining Courses Architectural Drafting Mechanical Courses ☐ Air Brake ☐ Car Inspector ☐ Locomotive Engineer ☐ Locomotive Firemas Assonautical Engineering Airplane Drafting Architecture Flight Engineer French Bridge and Building Foreman Building Estimating Civil Engineering | Coal Mining | Contracting and Building ☐ Hailroad Section Foreman Foundry Work Good English Boilermaking Combustion Engine Engine Running Marine Engineering Steam Electric Steam Engineering Courses Reat Treatment of Metals High School Rollermaking Combustion Engineering Higher Mathematica Industrial Engineering ☐ Industrial Matallung ☐ Machanical Drafting Industrial Matallurge Illustrating Highway Engineering Lumber Dealer Motor Traffie Alternated Represent Postal Service Reading Structural Biosprints Sanitary Engineering Mold-Left Work Salesmanship | Patternmaking | Reading Shop Blueprints | Sheet-Metal Dysfting | Sheet-Metal Worker Steam Engines Secretarial Structural Drafting Structural Engineering Surveying and Mapping Tertile Courses Cotton Manufacturing Sign Lettering [[Bosnish Sign Letteria Stenography Traffic Mane Cotton Manufac Rayon Weaving Home Address...... Working .. Position ... Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada, British residents send coupon to 1. C. B., 71 Kingsmay, Landon, W. C. S., England. DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES

Copyrighted inserts

THE CHEMICAL FORMULARY

By H. Bermett Vol. 7—1945 Edition The latest and most up to date Formulary

Here here I amount are the standy of agreement of the first har I amount are the smaller of agreement agreement of the first har a dispersion of the standy Philipped of the table for

IT'S FUN TO DRAW

bet on a the inputs on that has but proceedings for the state of the conntrae it serie (PH tt) 55539 to dise and her is offsale, tift quirestifficati polyetty. For the proto dipp at it is a moure and and we cat ring he of it in the Title book paided you're as the first strake through parties you from the first strake an paper to be at any life for all and any first parties. The first and are a fact that a first parties and are a fact that a first parties and the first parties and the parties an



Practical Lessons in HYPNOTISM

By Dr. Wm. Wesley Cook

Topoched you has been a chest of all the statements are often as a particular state of the statement of the

IT'S FUN TO BUILD THINGS

Make and Fin Things For Your House The state of the state of a set base state or the state of a set base state of a he his high the the runs on run I do not not to be a selected in the first and make the property of the first and the runs of the first and the runs of the first and the

Martine that of Things To have Poorle Blacks and Frage Poorle Blacks a place of Black and Chinas.

Marie Rolls of the Mark Rolls of the Control of the Contr the r. Dissipatives. The second section of the part for the same for the same section of the same section. To a head of me of the tellings 84 the and by hings Longe has 44 Part : the Tables DN: Tar at PHE 4 45 .50 them the array passes are

TO

HOW TO DEDER! It! out coupon and mail be some Man books guaratured satisfultors Α... money back at once All mone for size beautifor a printed with a bound if rem thance en-closed we has postage U Col D sent plus just-age NOTE the to newly increased postage rates on p mum COD total charges amount to 38c we suggest payment with order t MONEY SACK GUARANTEE: If not completely sat sied for any reason return books and get money back at once

PLASTICS

Scientific and Tochnological

By M. Swapld Stock

In the noting per of the demand for a settle of the demand for a settle of the control of the The settle of the se white must be the extrapolated the situation in the situation of the situa The section of the section of the section of to the boundaries of the property of the boundaries of the boundar to be used to see a secretic of the topological my phones feetbally it in the girls to be a si fat a diagrams, and date designed persons in the pro-dense at Sulb and platety who are to a me for a rec o and are I described all their title is required and are I described their required and post of their all plants and their results of plants in their states of their plants. product of the chemistry of plantly the stars consequence of plant com-lemnia openiate automorphysical ternite agrifate automo y panale per je je ternite de ternite en ternite de des enternites de la constant de la

her y a reinstructure project of deep and modes of \$6.50

WATCHES TALL

An up-re-duty bank depicts with fine-less methods of equals adjustes of same representations of procedus represents with an arrest of procedus represents with an arrest than the letter feet of the process. fed all theme inversed in hermony perfectionally or otherwise. If pen have a wall is that in source and removing property you is the glob to \$2.50 result it received.

A SMALL BUSINESS OF YOUR OWN

With Capital Interstment From By Hereld S. Kele

do month type a said interestant book and ones for he me tone of communing field which in the many first and the many first and the said of the said o mathem who not from my formally to be required to the formal of the formal form FARM OF TO B OWN DAY to During START A Main the life B will a han in the red w or about mint squares and rabout n mail ander boots on all he finer highways pay.

They life life and he bear the life of the life and life a

TORNE HERE THE \$1.00

DIESEL ENGINE OPERATION

It is interaped on.

Some the a latter from the new process of the action of an example representation of the action of the acti a interacted and meltern for over-The state of the s fature of a distance transport of the fature PRICE

\$2.00

3000 MECHANICAL

the en 2 models of the transition of the ending the end 2 models of the transition of the end of th

THE ABC OF PHYSICS

By Juranea S. Mayor

Serdam has at play toric present a 10 method and entrince of the 12 method and real this beach as entered in the of the 12 method and entered and the first that the most of the party of the the matter of the 12 method and the first the testing of the realization to the language of the testing of the realization the first of the testing of the testing of the realization of the testing of

RUBBER AND ITS USE

By Horry L Fisher

This are brother is a most practical treatment of a structure of the section of t things in head age exclude a stropy of the replace to that I need to make on a result rathers a properties of create and are accounted authors replace production and a control of create and produce and topic replace to the product and fur amplement by qualitative the profession of the complement by qualitative and in profession and in the profession and photographs. PRICE \$2.25

JIGS, TOOLS AND FIXTURES

By Phillip Butte

This bink is indispensable to annote interested in This book is terrepresented to accorde interested in territoria a soul a car of its most a carly we have been applied as the fact of the fact and the fact and the fact and the fact and the street of the fact and t James . 4-16 tor wifes A BUT STATE OF mot a feet find the bull of the de Parish to find the off is seen out of the graph of the description against Proceedings SPECIAL cutting agreeds ate and the last

KNICKERBOCKER PUB. CO., Bept. A-102, 129 Greenwich St., New York &

KNICKE PROCKER 130 Greenwich Be Sond me the bu	rest. Hew	Yack 6, N. Y.	
The Chestocal Formation; 11 t Fuer to Grow Hyperation 11 t Fuer to theird Things	1 00 F	Plantics \$4.50 Butches 2.50	0 9 000 Mechanical Suvements 92 00 The ABC of Physics 3: 90 F Rubber and 146 Uses 1 Just Tools and Fintures 2:30
Name			
Address	-		
Cly	***	*** ** *** *	State

• • • ARE YOU ASKING • • •

"How Can I Make Sure of My Peace Time Success?

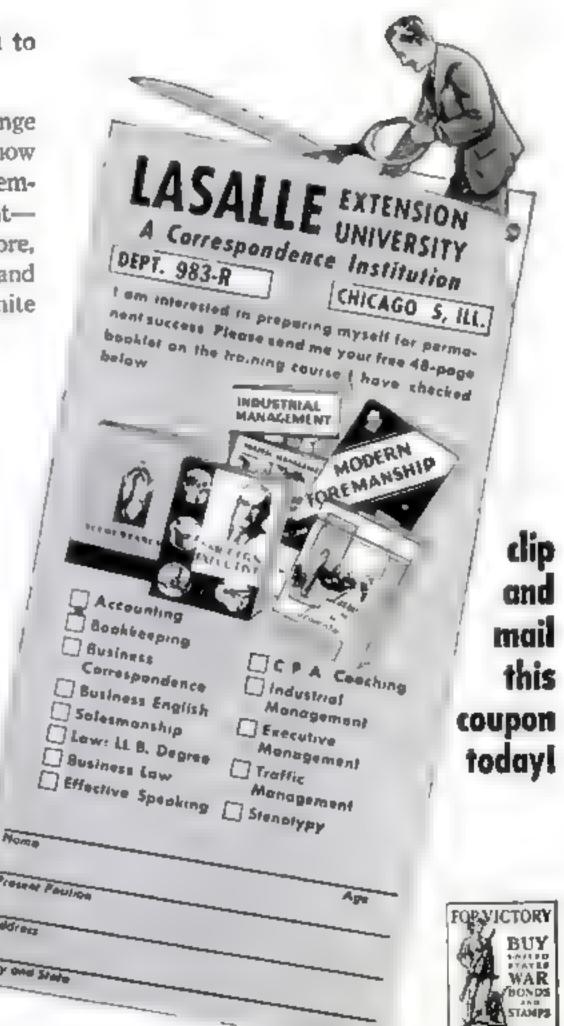
THAT'S a vital question for you to answer soon.

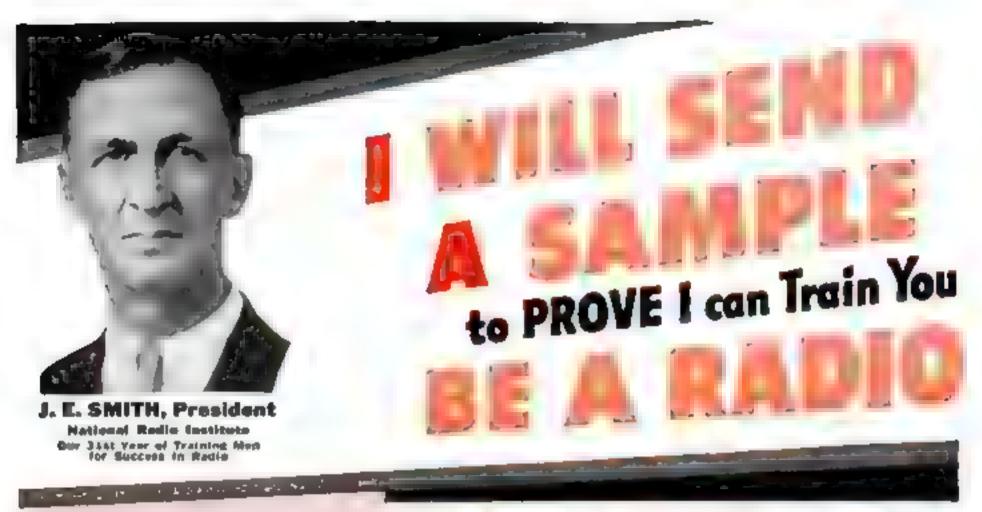
For postwar adjustment will change many things. Jobs that are good now may be very different then. War emphasis is on production in the plant peace may shift it to the office, store, management and sales. Overalls and slacks may, for many, give way to white collars and dresses.

Now is the time to plan and prepare—to get ready for the new opportunities. By training now in spare time, you can get in on the ground floor when peace comes.

LaSalle home study training—complete, authoritative, moderate in cost—will quickly prepare you for your chosen field, ready for the preferred positions. In our 37 years, over a million ambitious men and women have found it interesting and helpful in securing promotions or better jobs.

Send the coupon at right for full, free information. Or if you are not sure which is the best field for you, write us for our frank counsel—without obligation.





Good Jobs Like These Go To Men I Train



Farmer Made \$500 Extra— About

y in nabe a crack of the act of

8 For funding work on maria

every a spring for all a Track

or added a grant of 8 to be to

list year Free F 1 ABFN 8

[LFD 2 A conservance



\$10 a Week From Two Shop— Am

If which were \$ 3 a week proble
the not one of land another

NRI graduate withing for me I
len to him NR; men be also
they are we end to NORMAN

MILLER Deprop Neb



Runs Repair Shap for Seart Rochuck— I was a harber and of warking area in A or about 30 cas as a n v ar Course I are a th Sears Rue hard on new ran treer rate pers r sh s here at a n e stears rame. Nothing Prists FF 23 E 13th St Davement fown



the constant in Space Timethe constant in Rach and Entre has a of nones which has been ervour able the contract has tending I the contract and tending I the contract and I make year I a constant and Surse to a month FIFO H GRIFTE Rease 3 Newville Pa



Transmitter Vetwork Engineer

I pin in NRI transmitter and a transmitter and a transmitter and a near benefit for the of the works - THPODORE CAMPBELL.

Junatowa, Pa.

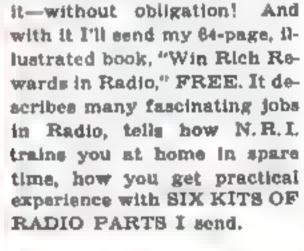
Get into a Busy Field With a Bright Peacetime Future

YOU MAY NEVER SEE A BETTER TIME TO GET STARTED IN RADIO

I want to give every man who's interested in Radio, either professionally or as a hobby, a copy of my Lesson. "Getting Acquainted with Receiver Servicing"—absolutely FREE! It's a valuable lesson. Study it—keep it—use



RADIO RERVICIOS ipicture above, para Techniciano gond money apare or full time AAIIO OPER. ATOMS (picture at right dad interesting work in U.S. Broadcasting and other types of Stations.



My Radio Course Includes TELEVISION • ELECTRONICS FREQUENCY MODULATION

Think of the NEW jobs that Television, Frequency Modulation Electronics, and other developments will open in the future! I will train you to be ready to cash in when amazing wartime developments are converted to new civilian uses.





The Sample' Lesson will show you why the easy-tograsp lessons of the N R I Course have paved the way to good pay for hundreds of other men. I will send it to you without obligation. MAIL THE COUPON!

Good Future for Trained Men in Radio, Television, Electronics

The Radio Repair business is booming NOW. There is good morey fixing Radios in your apare time or own full time business. And trained Radio Technicians also find wide-open opportunities in Police. Aviation and Marine Radio, in Broadcasting, Radio Manufacturing, Public Address work, etc. Also, there are good jobs operating maintaining and installing Radio equipment used in schools, hotels, factories chirches, hospitans, offices, the Send for FREE book which pictures your atres trains opportunities.

Think of the boom coming when new Radios can be made! Think of the backing of business built up in all branches of Radio! And think of even greater opportunities when Trievision, FM Electronics can be offered to the public! Use only a few hours of your spare time each week to get into Radio NOW. You may never again see that time when it will be an analy and profitable to see the time when it will be so easy and profitable to get started. Mail coupon for complete information

Many Beginners Soon Make \$5, \$10, a Week EXTRA in Spare Time

The day you enroll I start sending EXTRA MONEY JOB SHEETS to help you make EXTRA money fixing Radios in spare time while learning. You LEARN Radio principles from my easy to greap Lessons PRACTICE what you learn by building real Radio Circuits with the six kits of Radio parts I send—USE your knowledge to make EXTRA money while getting ready for a good full time Radio inh Radio job.

Mail Coupon for FREE Lesson and Book

MAIL THE COUPON for your SAMPLE LESSON and REE 64-page book. See how practical it is to train at home in your space time. Read the detalls about my Course. Bee the faacinating jobs Radio offers. Rend letters from men I trained telling what they are doing, earning No obligation Just MAIL COUPON in an envelope or paste it on a penny postal.

J. E. SMITH, President, Dept. 5.193 Notional Rudio Institute, Piencer Home Study Redie School, Washington 9, B. C.

GOOD FOR BOTH SAMPLE LINEAR

National Radio Institute, Washington 9, D. C.

Name

Mail me FREE, without obligation, Semple Lesson and 64-page book "Win Rich Rewards in Radio." (No salesman

J. E. SMITH, President, Dept. SIP3

will call. Please write plainly I



Zone . . . State

skows fr tess and in -

11 to Practice

or was to home Given you

Win Rich

Resemble

in Ruder



WERE the great personages of the past victims of a stupendous hoan? Could such eminent men of the ancient world as Socrates, Pericles, and Alexander the Great have been deluded and cast under the spell of witchcraft—or did the oracles whom they consulted actually possess a mysterious faculty of foresight? That the human mind can truly exert an influence over things and conditions was not a credulous belief of the ancients, but a known and demonstrable fact to them. That there exists a wealth of infinite knowledge just beyond the border of our daily thoughts, which can be aroused and commanded at will, was not a fantasy of these sages of antiquity, but a dependable and to which they turned in time of need.

It is time you realized that the rites, rituals and practices of the ancients were not superstitions, but subterfuges to conceal the marvelous workings of natural law from those who would have misused them. Telepathy, projection of thought, the materializing of ideas into helpful realities, are no longer thought by intelligent persons to be impossible practices, but instead, demonstrable sciences, by which a greater life of happiness may be had.

One of America's foremost psychologists and university instructors, says of his experiments with thought transference and the powers of mind—"The successes were much too numerous to be merely

lucky hits and one can see no way for guessing to have accounted for the results." Have you that open-minded attitude of today which warrants a clear, positive revelation of the facts of mind which intolerance and bigotry have suppressed for years? Advance with the times; learn the truth about your inherited powers.

Let this free book explain

The Rosicrucians (NOT a religious organization) have been leaders in introducing the encient wisdom of mental phenomena. Established throughout the world for centuries, they have for eges expounded these truths to those thinking mentand women who sought to make the utmost of their natural faculties. Use the coupon below—avail yourself of a pleasing book of interesting information which explains how you may acquire this most unusual and helpful knowledge.

The ROSICRUCIANS

(AMORC)

Scribe L P T The Resicrucians, AMORC. San Jone. California. I am sincerely interested in knowing more about the fullness and happiness of life. Please send in without cost, the book, "THE MASTERY (ng ie. OF
LIFE," which tells me how to receive this information	10.
Name	
Address State	

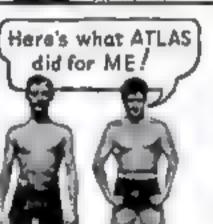


Will You Let Me PROVE I Can Make YOU a New Man?

SHOWING YOU RESUL



What a put 31 z nn christ I bermel confi 21-y supunded



John Josofts

BEFORE

recommend CHARLES ATLAS "Am bending anapahet showing wonderful prog-G . N 2. Folk

For quick results



"When I storted,

GAINED

POUNDS

we)ghed only 143 Now 170. Here's What Only 15 Minutes a Day Can Do For You

DilN'T care how old or young you are or how ashamed of your present physical condition you may be if you can aim oly came your arm and her it I can add solid) MI MCLE to your bleeps—yes, or such arm— in double-quick time. Only 15 minutes a day-right in your own homeno cost if I fail,

I can broaden your aboutders, strengthin your back develop your whole toused-lar system INGIDE and OUTSIDE' I can idd Inches to your chest, give you a vice-like and inches to your chest give you a vice-like grip. make those least of yours I the and invertial. I can shoot new attensith into role old backbotte exercise those interingens, help you cram your bony to full if pop, rigor and red-backled ratelity that you want I feel there's even standing toun," left for weathers and that lasy coling! Before I get through with you I il have your whole frame "measured" to have your whole frame "measured" to a hice, new beautiful suit of muscle?

What's My Secret?

"Dynamic Tencion!" That's the ticket! The bientical natural method that I my self developed to change my body from the crawn, akinny-change my body I was at If to my present super man physique! Fhousands of other fellows are becoming marrelogs physical specimens—my way I give you no gadgets or contraptions to fool with. When you have learned to de-Teason' you can lough at artificial you can lough at artificial muscle makers. You simply utilize the IN RALANT musele power in your own God given body watch it increase and multip y double-quick late real poild

My method-"Dynamic Tension"will turn the trick for you. No theory - story exercise is practical. And, men, so easy! Spend only 15 minutes a day in your own home. From the

very start you'll be using my method of 'Dynamic Traston' actions uncounter purity every min-ute of the day walking, bend-ing over, sie to St LLD MUS-CLE and VITALITY

FREE BOOK

"Everlasting Health and Strongth"

In it I talk to you in straight-from the shoulder language Packed with inspirational pic-tures of myself and pupils - fel-lows who became NEW MEN in strength my way Let me show you what I helped THEM do, the what I can do for YOU! For me you that I can do for YOU! For n rest thrill send for this book today AT ONCE. CHARLES ATLAS Dept 10, 113 East 13rd St. New York 10. N. Y



Awarded the title of "The World a Meat Perfectly De-veloped Man in internat unal Contest competition with ALL man who would consent to appear

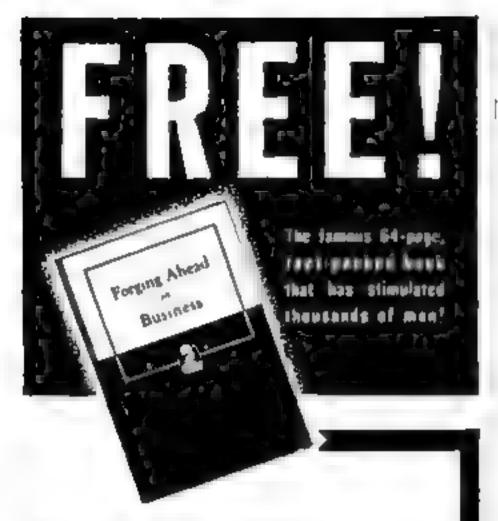
This is a recent photo of Charles Atlan showing how he looks today studia picture but an actual enapehot



CHARLES ATLAS, Dept. 19 115 East 23rd St., New York 10, N. Y.

I want the proof that your system of "Dynamic Tention" will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Evariating Health and Strangth,"

Name (Plane print or write plainly)	
Address	44111
Mente	



"Forging Ahead in Business" is a practical, thoughtfully-written book with "punch" and common sense on every page. It carries a message of vital importance to every man who wants to make more money, get a better job and improve his station in life.

Partial Contents:

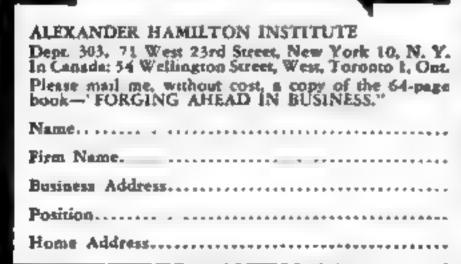
- Law of Buccess
- Farging a Cureer
- Highway of Achievement
- Making Begisians

Noted Contributors

Among the prominent men who have contributed to the Institute's training plan, which is described in "Forging Ahead in Business," are: Thomas J. Watson, President, International Business Machines Corp., Clifton Slusser, Vice President, Goodyear Tire & Rubber Co.; Frederick W. Pickard, Vice President and Director, E. I. du Pont de Nemours & Co.

Simply zeturn the coupon below, and your FREE copy of "Forging Ahead in Business" will be masted to you.

MAIL COUPON TODAY



Buy War Savings Bonds and Stamps regularly.

Write your own Juture in Photography

Prepare now for a well-paid position today and

a postwar career that is different, fascinating and profitable. Photography offers ever-increasing opportunities for both men and women. FREE book tells how N. Y. I. experts can quickly train you at home or thru resident, day or evening instruction in our up-to-the-minute N.Y. studies. Start now. ALL branches of black and white, motion picture and COLOR photography, Write TODAY!

New York Institute of Photography Dopt. 5 10 West 23 Street New York 1, M. Y.

Must well-paid positions semand high school training. Without it or equivalent, you can't advance to the full statent of your shift is in any trade, histories or profess on Whatever your age, however you're stuated. IT has I MECERRARY TO STRUGGLE UNDER THAT HAND! CAP I C S, famous for more than 50 years, enables you to mart your own high school in your own hame You're in a class by yourself—study in your spare time—sequire a high school eduration at asteriahingty law onet. Authoritative lexis! Rapid Progress! Write today for free bookst.

Intervolleral Correspondence Schools, Dax 7832-L. Stranton E. Pe.



love good Jobs now in Drafting Learn AT HOME in spare time (or at our Chicago School), Sand postcard for FREE TRIAL LESSON and see how easy to learn and get a good job.

CHICAGO TECHNICAL COLLEGE 40-216 Tech Bidg., 2000 E. Mich, Ave. Chicago 16, St.L.



IN 90 DAYS

Money-Making Career Open to Men and Women, 18 to 50

Hundreds of men and wemen briween 18 and 50 make \$15 to \$20 in a single day giring scien the Sweatch Museage and Hydro-Therapy treatments. There is big demand from doctors, bospitels, sens-torioms and clubs. Gradustes care large full time incomes from these or in private practice in their own offices. Others make good

money from bome treatments given in spare time. Learn this interesting money-making profession in your own home through our home study course. Same instructors at in our autionally known resident school. You can win independence and prepare for future security by qualifying for your Diploma. Course can be completed in its 4 months, Many earn while they learn. Begin your training at such



Address

Anatomy Charts & Booklet FREE

Enroll now and we will include, at no extra cost, many needed supplies. Fit rourself to help meet growing demand for massage now and after the war. Bend the coupon at once for semplete details, Anatomy Charts and 32-Page Illustrated Souklet,

State

THEE, PRINCE		
THE COLLEGE OF SWEDISH MASSAGE		
Dont. 370L, 100 East Ohio St., Chicago II, 117 nois Please send me FRES and postpaid, Austomy Booklet and complete details on Home Training.	Charta,	22-page
Name		

NOW Is the Time to PATENT and SELL Your Invention

Now, more than ever before, is the right time to patent your invention. Why? Because manufacturers everywhere presently engaged in war production are looking ahead to the future by buying up patent rights now, so they will have new and attractive items to make and sell for civilian consumption as soon as the war is over. This is what happened during and after the last war. Hence, the smart thing for you to do is to look ahead to the future too. Protect your invention and yourself by applying for a patent now.

Patent Guide Shows What To Do

Our "Patent Guide for the Inventor" answers many important questions concerning Patents that inventors constantly ask. It tells what facts, details, drawings, sketches, etc. are necessary to apply for a Patent; how to protect your invention through dated and witnessed disclosure; how to do this AT ONCE to safeguard your rights; how Patent Office Records can be checked to determine whether the invention is probably patentable before filing fees need be paid; discusses costs involved and a practical way these can be paid as the application progresses. It tells how some inventors secured financial backing; how many simple inventions have proved large commercial successes; how Patents covering improvements also can be profitably utilized and marketed; tells countiess other facts of interest.

Why You Need Expert Assistance

The Patent Laws were enacted for your benefit—to give you protection for the features of your invention which are Patentable. But these features must be legally and concisely set forth in the form of "claims." This phase of the procedure is so complex that the Patent Office advises the Inventor to engage a competent Registered Patent Attorney. We maintain a large staff—carefully trained registered patent attorneys—expert draftsmen—experienced searchers—to serve you. We have been serving inventors for more than 20 years.

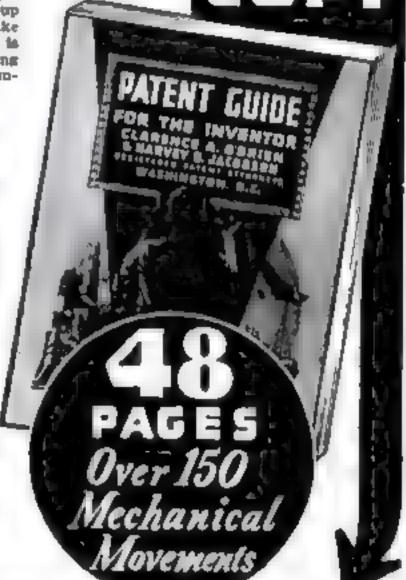
Take First Step Now

With the Patent Guide you will receive also Free a "Record of Invention" form which will enable you at once to establish the date of your invention, before you file your Patent application. This step costs you nothing yet may be vital to your success. Hemember—in Patent Matters, ACTION is IMPORTANT. Delay can be costly. Mail the coupon in an envelope, or paste it on a penny posteard NOW.

CLARENCE A. O'BRIEN & HARVEY B. JACOBSON

Get Two States Admin Soliding
Westington 4, D. C.

IMMEDIATELY MAIL COUPON TODAY!



CLARENCE A.O'BRIEN

CLARENCE A. O'BRIEN & HARVEY B. JACOBSON Sophimed Palent Agerbays Indian State Palent Office

52-J Adums Building, Washington, D. C.

Please send me your 48-Page "Patent Guide for the Inventor" and your specially prepared "Record of Invention" form FREE. This request dom not obligate me.

Name _	 	
Address	 	
City	 1	State

(Please write or print plainly.)



Ways to Reclaim Old Fluorescent Tubes

IN ANSWER to BRL, there are two uses I can auggest for burned-out fluorescent lighting tubes—one for recreation and the other for utility. Throw a tube into a swiftly flowing stream, and with a .22 caliber rifle shoot off the end. As the tube bobs up higher, keep on shooting until it sinks. For utility, the larger size might be used as the outer tube of a Liebig condenser. Cut off the ends and clean out the fluorescent material; then take two large corks and cut two holes in them. Into these place a short piece of tubing and silde the corks into a tube longer than the fluorescent one. Connect this with rubber tubing to a retort and place the other end over a flask. By running water through the outer tube from bottom to top, you can distill liquids.— WCN,, Rock Hill, SC.

This Man Has a Vision of the Ideal Trailer

Like a lot of other men, I want to build a house trailer. Present trailers are all right in their way, but they are built primarily for

use around tourist camps where electricity and water pressure are available. I want a trailer that carries an independent electric system and water system of its own. I know there are small gasoline-electric generators built, but they are heavy-duty affairs, and they weigh and cost a lot.



How about rigging up a very small gasoline motor to drive a car generator and battery system? I think an electric refrigerator would be convenient in a trailer. So would an electric razor

As for water, the only thing I have thought of is a water tank with air pressure. I see that airplane oxygen bottles are for sale at the war-surplus outlet stores. How would

they do for pressure tanks? Would a built-on hand pump do for it, or could a small compressor be connected to the car motor? Maybe gasoline service stations would let you fill the pressure tank from their air hose for a price.

Butane gas is very nice for cooking With this and water pressure, it would be simple to have a small water heater, and with hot and cold running water, a shower bath could be arranged I have been thinking of using Plexiglas for windows, and perhaps a small bomber blister for a skylight. Outside of these things, I would like a gas-operated refrigerator, and I'd like to know if a small one could be made to use butane gas.—
J. R. N., Bell Gardens, Calif.

Here Are Suggestions for Braking Power Snow Sled

I have some ideas that may help P. H. with his braking trouble on his power snow sled The first, and probably the most efficient, way would be to mount a marine transmis-

sion between the motor and the propeller that would enable him to reverse the propeller and allow it to serve as a brake This method would bring him to a complete stop regardless of the snow conditions. Maybe flaps would do the trick They do all right on Army and Navy fighters and bombers.



They could be closed to lie flat along the fuselage of the sled and opened either hydraulically or electrically. A search of war surpluses now for sale should reveal something usable. What I had in mind was an electrically operated device called an actuator. It would snap the flaps open in a fraction of a second and slow down the sled considerably, although it would not bring it to a complete stop.—A. R., Bedford, Ohio.

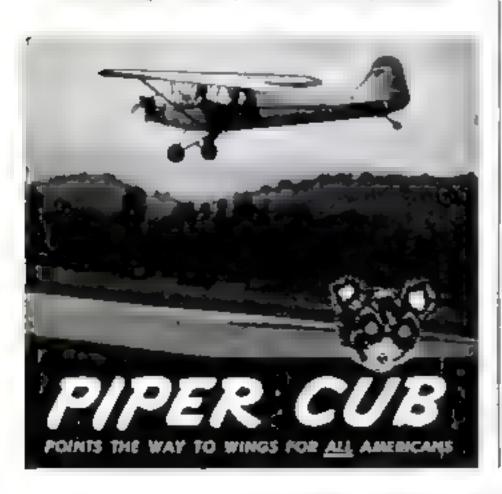
A. R. has ideas, but they bring up practical difficulties. A reversible propeller would, more than likely, snap the shaft if it were used suddenly to brake a swift-moving sled. Flaps opened toward the wind would also snap; away from the wind, they would have only a slight effect Perhaps the drag device used on dog sleds is the best type of brake. It's simply a flexible board fixed to the forward end of the sled and suspended from the rear by a spring. When the operator steps on it, a serrated steel blads at the end digs into the snow or ice and stops the sled.—Ed.





New Booklet Shows You With Over 50 Photographs

You'll really go for the "How to Fly a Piper Cub" booklet. It takes you on a typical flight lesson... from pushing the Cub out of the hangar to landing it and putting it away. Written and directed by a certified flight instructor. Includes many other features and full-color pictures of Piper Cubs. For booklet send 10c in stamps or coin for postage-handling. Piper Aircraft Corporation, Dept. PS95, Lock Haven, Penna.





P.S.M. Spells Relaxation for This Active GI

I've any with Patton's army from the day I bit Europe to the mopping-up process that saw the war's end in the European Theater of Operations, and your magazine has given me many moments of relaxation. I can even forget sights like Buchenwald by thumbing my worn copies of Popular Science.—Cpl. G. F., APO, New York City.

Gus Wilson Saves Money for a Perplexed Motorist

My pavoning article has always been the story about Gue's Model Garage. Some time ago, I read where Gue's genius for trouble shooting was put to a test in finding a short in a car's wiring system. He discovered it in a wire connecting with the trunk lid of the car. A week ago, at Delaware Water Gap, Pa., I ran into a similar difficulty. At sundown, after driving most of the day with no trouble at all, I switched on my dim lights. They were on for a second, then they flicked off and then on, and so on. Each

time they went off, my ammeter flew to full discharge. When I switched them off, the ammeter registered normally until I turned on the lights again. Any position on my light switch gave the same reaction.

For a time I was at a loss for an answer. Then I remembered Gus's case.

-IN CASE IGET STALLED

I pulled over to the side of the road, and asked my wife to look at the rear lights. There weren't any. So then I told her what I had read in Popular Science, and I diagnosed the case. Sure enough, when I opened my rear-deck lid, I found that my suitcase was hitting the wire that ran from the body to the deck lid. I removed the suitcase, and my troubles were over. Thanks for a swell magazine, and special thanks to Gus for saving me a repair bill and a possible fine.—
J. W. C., Drexel Hill, Pa.

AUDELS REPRIGERATION 8

AIR CONDITIONING GUIDE . \$4 basic principles, servicing, operation & repair of household, con-mercial & in-instrict refrigeration & air conditioning. A gold mine of essential important facts for engineers, servicemen, users.

AUDELS CARPENTERS & BUILDERS

A practical filustrated trade assistant on modern construction for carpenters, joiners, builders, prochanies and all woodworkers. 4 vols., 1600 pages, 3700 illustrations, fierlish covers. Packet size. Each volume sold separatriy \$1.50 a vol.

AUDELS AUTOMOBILE GUIDE.....\$4
A practical quick randy reference book for auto openanies, person Dien, opera ors & owners. Explains theory, construction & service is a of inviern motor cars, trucks, buses & auto type Diesel engoles, 1540 pages, fully illustrated, 55 chapters, Indexed, & standard book for mechanics. New Suid drive covered.

AUDELS DIESEL ENGINE MANUAL.52 A practice, concase treat to with questions and answers on the theory, operation and maintenance of moneya diesel engines including General M tors 2 excess Diesel, 254 pages, fully illustrated a binocht, purhet size. All deseats plantly brought put, thus book in of extreme raise to engineers, operators & students.

trical apparatus. It shows e early how to wire apparatus for prac-I raily all flerds of electricity Each diagram is complete & scaf-explanatory, Highly Endorsed Pocket Couper.com.

AUDELS PLUMBERS & STEAMFITTERS GUIDES-4 Vois

Practical Trade Assistant & Ready Reference Pupia es in D a B language & by clear t ustrat ont, diag ame charte graphs

AUDELS SHEETMETAL WORKERS HANDY BOOK S1

348 papes. I Justrafed. 11 sections 4 early we teen. Es entite & Important facts, figures, pointers in everyday language. Bet. Index.

AUDELS SHEETMETAL
PATTERN LAYOUTS. \$4
Developed by Esperts for Sheet Mr at Workers, Layout Mee &
Blechan et. A Practical Encycloped a in 10 Sections size 7 s 19

A Pages-and Le man-1800 I sucrement and key Facts Fully indexed for ready reference in answering your largest to the email Covers all phases of sheet could work including Pattern Lu ting, Pattern Decempment & Shop Precedure.

AUDELS ANSWERS ON Per Merhanies & flui ters I ners all types of blue print reading toriuding ship & expisses, 376 pages, fully illustrated.

AUDELS NEW MACHINIST &

TOOLMAKERS HANDY BOOK, . . . \$4. tical books in | New from ower to cover. Tel a how to set up & nice and lather, force and mil my machines, shapers dual presses and all other machine tools 10 0 pages fully i ustrated. No 6 2 2 2 Indexed. S sections, 1—Modern Mach no Phop Practice 2—Hive Print Reading & How to Draw 3—Lateu atoms & Mathematics for Machinest 4—Shop Physics, 5—How to Une the Mide Rule, 60 ct apters. Easy to read and understand. A shop companion that answers your questions.

MATHEMATICS & UDELS

CALCULATIONS FOR MECHANICS \$2 Mathematics for home study or reference 700 pages, \$50 time. Practical mathematics from beginning. How to figure correctly. Easy, correct methods covering a complete review. III. & Indexed.

AUDELS HANDY NOOK OF PRACTICAL ELECTRICITY

form-including Marine Weing, to heady Welding Indexed. A key to a practical understand mg of electricity

AUDELS RADIOMANS GUIDE. \$4
A key to the practical understanding of sucho including Frequency
Midulation, Triestation, etc., Alterest & Marine Radio For radio

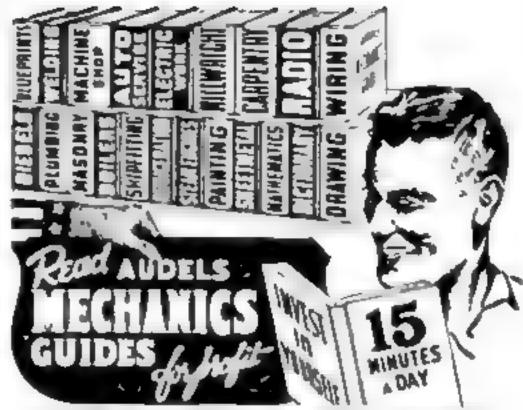
engineers, servicemen, amateurs 772 pages 400 l'itustrations & D'agrams. Photos. Review Questions & Answers, Beference Index. Auther to, esenz, concine

AUDELS ELECTRONIC DEVICES \$2. Tells What You Want to Know About Electric Exa Easily Conferstood. Covers photo-electric ocids & their applications. Amplifiers, Clumination, frequencies, butage, photocail, tubes, Ohm a Law, wiring diagrams, etc.

AUDELS WELDERS GUIDE ST A concisu, practical text on operation & ma prepared of all welching marblines for all mechanics. Over 400 pages untrated toward all

methods of electric and acetylene welding horluding airplane work.

AUDEL, Publishers, 49 W. 23 St., N. Y. 10



AN AUDEL GUIDE IS A GOOD FRIEND!

Use the brains and experience of others in these Guldes of the Trades. Save time and money with right methods, short cuts, labor saving ideas. CHECK NOW! You can look over pny Audel Guide in your home, Start the Easy Payments if satisfied.

HEREsman

THEO. AUDEL & CO., 49 W. 23 St., New York 10, N.Y.,

Please mail me for I days' free examination the books Emarked (X) below, I agree to mail \$1 in 7 days on each book or set ordered, and to further mail \$1 a month on each

DO		n nut m									
_		REFRI									24
		POWE	PLAN	EMC	INFE	3 (1)	10.5			4	7
ř	Audes	PUMP	NYDE	AULI	***	री बन	DMP	REM	LÒN	ń.	I
		WELD							-	Ţ	
		BLUE			WG.		4 4				Ξ
		SHEET				Hand	ly Be	eta 🗀			ī
Ē	Audels	SHEET	METAI	PATT	ERM	LAYO	UTS	4	4		4.
Ξ.	Audols	AIRCR	AFT W	DRKER	1	2- 2-					1
-	Audelg	MATH	EMATIC	S and	CALC	ULAT	108			4	2
	Audels	MACH	INISTS	# 100	LMA	KERS	Haru	ty B	ook;		4
	Audels	MECH	ANICAL	Dietie	appeal.		* *		4	•	4
in. 1	Audels	AUTOR	HORILE	CUID				_	4	4	4
÷ '	With space	MARIN	T THE		NUAL	4.5.	2 1		4	4	2
	Audel	SHIPF	TTER	وخينواه	B PLBN	ey 20			•	4	÷
	Guardia	MECH	A GA	ORA	400	COM	eint "		1	٠	ì
È	Berer	DRAW	MG BE	DESI	GM		-	*	4	1	2
		MILLY				amics.	Cuid		1	1	4
		CARPE							L)	-	E
		PLUM									Ē
		MASOR).		4	6.
	Master	PAINT	ER and	DECO	RATO	R .	4		Ψ.		2
	Audels	GARDI	ENERS	A GRO	WER	GUI	DES (4 99	le.)	ė	6.
_		ENGIN					des				
_	Plet.	1,2,2,0	6, 6, 6, 7	and	Comp	lete	airen"		4	_	ų,
	Y Penals	Armor	en Pr	MATICAL	FACT		TIPLE		4	_	1
		ELECT	TO EME				2		1		-
		WIRIN	C DIAC					-	_	1	ĩ
H		Handy		PPAG	TICAL					*	4
F		ELECT	RICAL	POWE	CAL	CULA	TION	15			2
-	Howhi	M ELEC	TRICA	Guid	es at 1	il eac	de .		·	. 1	ű,
-		الأساسات عل									-

Audete	NE		ELE	CTRI	C LI	BRAI	NY at	31.1	10 .	Vel	MITTER
Vels.	t,	Œ,	ш,	IV, Y	/, VI,	AII.	VIII,	łx,	X,	ХI,	XII.

Occupation.....

Employed by.....

Audets ELECTRONIC DEVICES Audets ELECTRIC Dictionary Audets RADIOMANS GUIDE

19

1 pt. of Pyroil

(IN CRANKCASE)

1 oz. of Pyroil

(With EVERY 5 GAL. GAS)

...ADDS MILES TO YOUR CAR!

It's one thing to keep your motor clean—but that isn't enough. The maintenance of proper lubrication is equally vital. That is why your gas station attendant prescribes Pyroil in regular dosages. It removes sludges, gums, carbon formations—but, even more, it maintains a clinging film of oil on piston and cylinder walls. That means less frictional wear—less rust and corrosion—more miles of carefree driving.

Manufactured and Guaranteed by Pyroli Company,

W. V. Kidder, Founder, 982 Main Street, La Crosse, Wis.

Pyroil adds life to your car!...





Handicapped Machinist Submits Better Name for Lazy Tongs

Answering the request for a better name for the so-called lazy tongs, I submit "extension pliers." It is the term I have used

for this most useful tool for a good many years. A veteran of World War I, I was retired as a first lieutenant and rated as totally and permanently disabled. Today I depend on my extension pliers for many things, even for tying and untying my shoes.

I operate a busi-



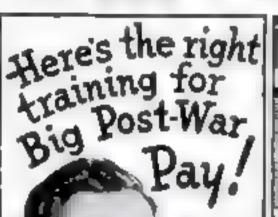
ness and do considerable work in a machine shop, where I would
be lost without the extension pliers to obtain
tools and parts out of my reach and to pick
up items of various kinds off the floor. During World War II, our shop has been turning
out parts for aircraft engines, and I have
depended on this tool to help me overcome
my physical handicap. It is definitely not a

lazy tongs, but a decided asset in my shop. Not being able to find them in stores, I have made extension pliers both for myself and for other shop men. I have used heavier tools of this kind to extract castings from a die-casting machine and to lift a crucible from a furnace or heat-treating oven. Perhaps the heavier tool should be called "extension tongs."—L. T. H., Lawrence, Kan.

How to Remove a Rock Ledge from Your Driveway

Some time ago a reader requested a method for removing a ledge of hard rock that blocked his driveway. I have not seen a solution of his problem appear in your magazine since, so I submit the following suggestions, which I hope will be helpful. Build a hot wood fire on top of the ledge, and allow it to heat the rock to a considerable degree. Haul off the coals and throw a bucket of water on top of the ledge, which will crack up into slabs that can easily be picked off. I used this method on an engineering project in Vermont many years ago, and it worked very well. The sudden uneven expansion and contraction did the work.-R. K. C. Detroit, Mich.

I'LL SHOW YOU HOW TO SUCCEED. RADIO

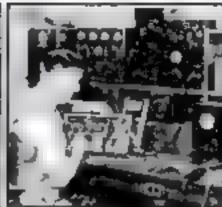




EADIO SERVICE BUSINESS OF YOUR OWN



A GOOD JOB IN RADIO & TELEVISION AROADCASTING



HADIO-ELECTRONIC SERVICE ENGINEER



NOW! YOU CAN PREPARE AT HOME IN SPARE TIME

The effect f make you here in the op-portunity of a lifet me the your big chapte to get ready for a wonderful future in the excitive expanding field of Radio-Fredronian INC (UDING Ra-dio Televia or Fredspace Modular and and Industrial Electronics Me tion and industria. Flectropies Be-wise N:18 K the time I, start Opportunities about are tremendate N previous ex he care
is necessari. The Sprayberry
course starts cital at the
beginning of Radio N a
can tiget but. It gets the

seg noting of Radio Y 4 can tiget but In gets the can tiget but In gets the can be removed and can truncation and contract and can maker my entire course to your spaces the course to your spaces the course to your spaces to the course the course to your spaces to be course to your spaces to be course to be course. interfere to any way

with your present duties. Asong with your Tinio ag you will receive my fa-mount BUSINESS BUILDERS which will profits with learning

Property You for a Business of Your Own or Good Radio Job

My training will files you the broad fundamental princip so so december as a tackground no trainer with a breach of flad o you wish to special as in thake it case for you to learn fields Set Repair and Installation Work I teach but they for installation to the flactories. Fan prient in fact you I be a fully con ined RADIO ELECTRONICIAN equipmed with the shill and horw edge to perform an ently and in make a wonderful success of tourself

d o E ectropica. You must get it through do b betternes tou must get it through a mplified lesson study combined with school photoe under the personal guidance of a qualified Rad o Teacher. It a charily this way that Mprayberry trains you . supp y ing rea Radio parts for tears by doing experience right at home Thus you learn factor your understanding to certiful you acquire the practical how how ' essential to a good pay ing Radio job or a Radio business of

I'll Show You a New, Fast Way to Yest Radio Sets Without Mfg. Equipment.

The very same Radio Parts I supply with your Course for gathing Steen narience in Radio Repair work may be adapted through an exclusive Sprayborry methods you do not have one cent of outlay for manufactured Test uilpment which is not only expensive but ecures

Read What Graduata Says "One Job Hets About \$26.00"

Bince last week t fixed 7 radios, sit swood paying jobs and right now I am working on an ampiller system. This job ninne will not me about \$25 (b). As long as my work keeps coming in this way I have only one word to say and that is Thanks to tay Spraybeary training, and I am not afreid to boast about it." ADMIEN BENJAMIN North Creevondals Comp.

DON'T PUT IT OFFI

Get the facts about my training now! Take the limit important step toward the money making future of your dreams. All features are fully explained to my be illustrated FREE Catalog which comes to you atom; with another valuable FREE book you it be glad to now Wall Coupon AT ONCE?

explains in unitable new book which explains in a mple Eug ish her to tred and understand any Radio Sci the grammer of schill Included transma. Home of all Radio probble wend for the FRFE book how and along with a 1 2 w. 1 send you another filly FRFE book describing my Radio-



SPRAYBERRY ACADEMY OF RADIO

F. L. Sprayherry President Reom 1395 Pachie, Colorade

Please fish my FREE copies of How to MAKE MONEY in RADIO, FLEE TRUNK S and TEVENISION and "How to READ RADIO DIAGRAMS and SYMBULS."

Address

âtate

CITY (Mai) is plate envelope or paste on penty postcard)

Many Patents...If Secured Now...Have 3-Fold Chance to Become Profitable

Do you realize the value of your laborsaving or time-saving device . . . your unprovement on a machine . . . your gadget that does some job better or does a job automatically that has never been done before? Man-then think this over!

NOW is the time to have your application prepared and prosecuted because American manufacturers ere planning their coming peacetime production while they are out-pro-ducing the Axis. Thus— if your invention will help ment may adopt it Orone or more war goods Then -when peace comes -- many opportunities may or your invention is for pencetime use on yDON T WAIT Cash in on
the present weve of
'Post-war" thinking
WHATEVER TOUR INVENTION—THERE IS NO BETTER TIME THAN THE
PRESENT TO DO SOMETHING ABOUT IT

WE CAN HELP YOU

thoroughly Trained. staff here at Victor J. Evens & Co., competent-ly takes care of all the many inventors. The superlance of this stoff to your addurance that your natent application will be prepared in the proper manner and speedily pushed to a canclusion. We ve served men like

GET THESE BOOKS-THEY'RE FREE-THEY TELL YOU WHAT TO DO

These two big books. 'Patent Protection' and 'When and blow to Soil Your Intention, have he ped many inventors to success. They can be'p you! Sixty four pages of valuable information and guidance, well thustrated. Show details of 113 mechanics, the sements. They may be just what you need to compare to the entert to you will free the couper N W whi e it a freeh to your entert We it rush the books to you will free Evidence of Invention form that will bely you exhabited your claim.



SUCCESS COMES

COUPON TODAY—

Registered Patent Attorneys for Nearly 50 years 940-K MERLIN BUILDING . WASHINGTON-6, D. C.

Please send me your books "Patent Protection and "When and How to Se'l your Incention" also important " Evidence of invention form without cost or obligation

Midress

YOU

70

City and State

Get Started in Radio TEN "HOW-TO-DO" BOOKS



Get a solid foundation in radio by means of these He timely text books. Each capacity wratten, profusely lituatrated, contains over 15,000 words has I be amazed at the weath of toformation packed into bese bandy books. Excellent for reference ideal for technica, library Your money back if not antiafied.

10c each

5 for 50c 10 for \$1.00

We cannot fill probes for teas than 8 books.

Redic

No. I Now To Make Sets No. 2 Now To Make The Most Popular All Wave 1 and 2

Tube Beceivers Beginners o. 4-- Als About Aerials

3--- Wegenners RAdie OleNo. 7 - Now To Read Media Diagrams for 8-Radio for Regiment No. 9 Emple Electrical En-

tionary s. 6 How To Mave Fun With

periments Ne 10 - Television

Remit by check or makes order register letter if you send ash a stamps

RADIO PUBLICATIONS, 27A West Broadway, New York (7)

HOME

Courses to Engineering & services, Cytl Me hance; Drafting Architectural Steam, Acronautical Radio Structural, Mining Industrial Highway Potroleum, Marine Chemica, Courses in AFT And Sciences Philosophy Education Latters; Public Health Medica, Judiaprodence Psychology Roctology Physica, Course any Geology Pol Science Transley Law, Business and Commerce Accounting Mathematics Statistics Agriculture Medical Property, 4818-85, Statistics Agriculture

This new 128 page book, "Stammering Its Cause and Correction." describes the Hogue Unit Method for arrentific correction of stammering and stut-Oost, 1877, Greek Towar, Indianapolis 4, Ind.



Splandid epocetanities. Propers is spare time. Practical basic training keing established school, Sond for from book "Opportunities in Postneraphy" He obligation Americae School of Photography, 1315 S. Michigae Ave., Begl. 1365 Chicago B. H.

DON'T WAIT UNTIL THE WAR IS OVER!

Since 1923 Cal-Aero Technical Institute has been specializing in modern, progressive training for Auronautical Engineers and Master Aviation Mechanics. Propare now for your Aviation Career, BE READYI Opportuni-

ties are great today and will be greater in tomorrow's Age of Flight. DISCHARGED VETERANS-Write us about Aviation Training as provided under "G. L Bill of Rights."



AERO TECHNICAL INSTITUTE PRIL DACTIFE

> GRAND CENTRAL AIRPORT GLENDALE 1, CALIFORNIA FOR SHOELER COUNTY

his coupon

Col-Assa Tuchnical Institute, Grand Control Airport, Glondele 1, Cultivistic. Soud information and illustrated autologue un Arleiten

	harde * 4 *	 and the ball	47 L DA
Materia		 - Birth	Date
Street			



Tra a now for the postwar Radio-Electronic job opportunities which wartime needs and experiences are developing! Use your free time today to store-up practical knowledge and experience for good-pay tomorrow! Trained men will be needed for the huge postwar requirements of Radio and Electronics, Broadcast Radio, Aviation Radio, Sound Picture Equipment, etc. in n onniceturing, merch including, just alling and servicing

EARN EFTRA MONEY-

When you fearn Radio as DePORES I'S teaches it, you can start a Busianss of Your Own—be your own hoss. if you prefer! Even while learner g, you may earn extra n oney doing Radio Servicing with your home as your "other" but the facts about this fasc rating home training in Rad o-E ectromes

SEND FOR FREE INFORMATION!

Get "Va " for Yes buck and his grown have been him DePOREST 5 cra ung caune pigur tewards good pay and a better job to a permanent industry. Also ask about $DeFORE \wedge T \wedge Rest$ dential Training in the modern Charge Laboratories shown at left. Mad coupon today.

SYNCRO-ORAPHIC" CHIMINST

is the the house in costs agresentand. VISCAL method of Mark Instruction ted a gent to He-Move Projector and Treating forms'



"LEARN BY DOING"

5 under 135 has mintige hypermental with hilly both of the will farth and America town You and rush in Rada Reserving Lands Theten I e Devises in Austron Ban Lie a Public & about to stem B re-sens Managhorie etc. a in air spore time in the own Home Lateratory.



90 "SYNCRO. GRAPHIC" LESSON TEXTS

From red couler the sources such of the Lee-District the Fireman Room if he fortune bone and audier if over aid. Harm his to store purients.

ENE CONTRACTOR E

[h]-Olces] s also pera des a f fleet e I make went he are in act forgot and ged Parties at a appearing your of the above

F B DeVr Procust Dispose via Straining Acouse Dept Ps. Clarago 14 Trade 5 A S A Pt. se send for vior A10 FORY FOR YOR BOOK as I SQUIPMENT FOI DER	
Name	
Address	
	State

"I'll show YOU how to make yourself TOUGH as a MARINE



...OR IT WON'T COST YOU A CENT!" says George 4. Jowett

Let me prove to YO1 that you can not larger of denumbe muscles an your arms.' Add inches to your theat? Broader your shoulders and power park he rest of your body. I can do for you what I we done for I souther the world over Including today officers and mee bost. an tipe I S. and He I sh Armed Forces

GIVE ME 10 MINUTES A DAY!

I'll Show You My Secrets Of Body Building

I It help you learn the 'Progressive Power Method' through which I re in t mype f from a physical wreck to the bodder of more strength records than any of let I sing at hete or transper. No metter how haven a flather you are. You can earn my methods right in your own home. Through my proved secrets I show you how in develop your nower last is and out until YOU are fully estimated that you are the man you want to be. "The Jowett System says R. F. Kelly, Physical Director, Atlantic City, "In the greatest to the world!"

Send Now For Jowett's Photo Book Of Famous Strong Men And Folio Of Inside Secrets

Jonett's widely known Photo Book of Strong Sien has guided thousands of weakings to nurcular power. Packed with photos of m racio men of might and muse s who started probably weaker and smaller than you are Contains the story of Jovett, the the ling adventure in the ark exement of Cower that has inspired thousands like you. The ampains book at I be sent to you FREF! Also Jovett a Police of World Samuel Secrete tel a you how to gain strangth and how to

use your strength to account your It ends and Hoth FRFE for limited time win success white hey last

Jowett Institute of Physical Culture 230 FIFTH AVE., DEPT. 682, NEW YORK

JOWETT'S PHOTO BOOK OF FAMOUS STRONG MEN AND FOLIO OF INSIDE SECRETS

Jewett Eastitute of Physical Culture 230 Fifth Ave., Dept. 862. New York f, N. Y.

George F Jawett:--Your offer sounds rood to me Rugh me rear Photo Book of Strong Men and Inside Secrets, both PREE.

NAME.... Agen (Please Print Plainty Include Zone No.)

ADDRESS ___

START YOUR OWN REFRIGERATION REPAIR SHOP!

Exceptional opportunity for men of all ages up to 60 who like to work with tools. Learn to be a service mechanic in REFRIGERATION. Our practical, thorough home training is easy to grasp in your spare hours with a common school education. Learn how to start your own business with \$50,00 worth of tools

Barchian.

in garage, basement or small shop, Or take a well paid job in this active field.

Write for FREE BOOKLET today.

MECHANICS TRAINING SCHOOL

4701 West Pice

Dopt. 5-5

Los Angules & Calif.

The Min on Picture Theatre Hosbess offers big op-portunit so for trained men det into a fact hating held with a peace time future Train at home in space time Free catalog Established 17 years

THEATRE INSTITUTE 389 Washington 50.

This is the machine age And back of every teachine-enery part are the engineers who designed it, the trained fraction a who built it. No wonder there is high pay a , thank the one of them? This t shick is a rul too it is whose you the way in success. These Schools, famous for more than 50 years, offer sutheritative, practical Courses to meet the needs of almost any man in mechanical trains Mechanical Engineering Training Mechanical Desiring. Ship searches Write today for free booklet.

International Correspondence Schools, Box 7632-L, Screeton B, Po.

MAKING

the SPARS Times — by Lasy Picture Chart Mathed dame Simplified Method that has be ped it a screeters of Terry & Firsten, 'Freshive,' 'Out Day Way, 'Winnie Winkle,' 'Steplier Fellers,' 'Strake As & Second,' 'The Neighbors and many others. Earn while learning, thank life for Ficture Chart its test your all the Parappes of mercental students, and full details. (Mate age) Lucion School of Carteolog, Dept. 4529, Philadophia 1, Pa. C.



Learn BAKING At Home

Baking is one of America's high industries in wages.
Nearly depression-proof, Thorough basic home course lays sound foundation. If you have aptitude, write for FREE BUNCK LET, "Opportunities in Commercial Haking." Rollonal Bahing School, 1318 Mich. Avo., Dept. 1366, Chicago &

HOW TO BECOME EX-JIU-JITSU PERT, Keep Health, Have

Fun. Teaching 35 years. Send 10c for sample lesson. Modern School Jiu-Jitsu, Dpt. AA, 5 W. 52 St., N.Y. 19

TRAINED MEN NEEDED IN . NEW, ESSENTIAL INDUSTRY

Plastics is a great new industry and the time to get started in it is now. Opportunities are unlimited. In your spare time, at home, you can prepare to enter this important field. A new, practical training plan is now ready to help you realize your ambittons and win success. Send name and address today for FRFE information.

AMERICAN SCHOOL, Doot, P446 Dretol Ave., at 58th St., Chicago 37, III. Ritario C.

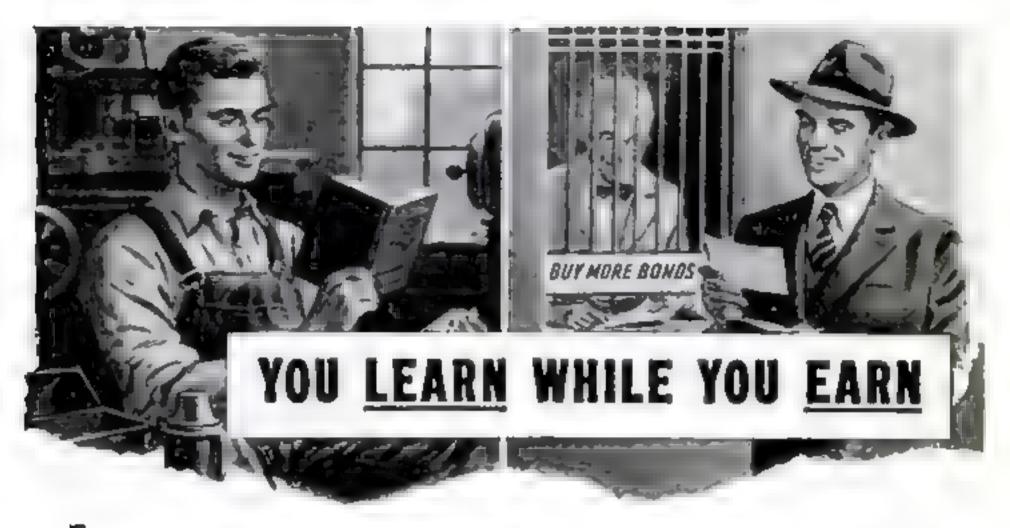
City, State-

Buy War Savings Bonds and Stamps regularly.

PHOTO SOOK

MINDE

SECRETS



HERE'S rhyme and there's reason in that statement of I. C. S. advantages to you.

The courses of these famous schools are especially designed for study in your spare time. At work you prove and apply what you learn.

This system is backed up by 54 years of I. C. S. experience in training men in virtually every industrial and business field. It works so well that analysis shows about

99% of today's 100,000 active I. C. S. students are holding down jobs.

Many of the men and women now filling top positions in commerce and industry obtained their business or technical training from I. C. S. in just that way. What they achieved in their space time, you can do in yours.

Start now - as they did - by marking and mailing this coupon:

INTERNATIONAL CORRESPONDENCE SCHOOLS BOX 7636-L, SCRANTON 9, PENNA. Without cost or obligation, please send me full particulars about the course before which I have marked X: Air Conditioning and Plumbing Courses D Air Conditioning D Heating D Plumbing D Refrigeration D Steam Fitting Tratile Designing Wootes Manufacturing C Phip Drafting **Electrical Courses** C Ship Fitting C Ship Fraction C Steel Ma: Workers C Tool Danguing C Tool Danguing D Electrical Draiting D Electrical Engineering D Power Hume Electricate D Practical Electricate D Practical Telephony Business and Academic Courses Chamletry Courses Chancel Engineering Weichtig, Gas and Electric D Tetagraph Engineering Radio Courtes Chemistry, Analytical Chemistry Injustrial Chemistry Nig Iron & Reel Petroleum Refining | Plactice Pulp and Paper Making Internal Combustion E Lectronia E Radio, General Enginee Courses Certified Public Accounting O Auto Technicas O Aviation O Dened Electric O Dened Engines O Ges Engines Lindso Operating Hadio Servicing Conege Preparators Commercial Relivoed Courses Air Brakes — Car Imparim Locumotive Engineer Locumotive Fireman Rasirond Section Foreman Steem Engineering Courses Bestermaking Complete Matthewalis Complete Ma Civil Engineering, Archi-sectural and Mining Courses Machanical Courses C Ale Brake C Car Imparies C Loromotive Engineer C Loromotive Fireman Acronautical Engineering Architectural Drafting Arptage Drafting Loromotive Fireman ☐ Arrhitecture ☐ Bridge and I Flight Engineer Civil Engineering Coal Mining Contracting and Building Contracting and Building Contracting Metallage Contracting and Contracting Contract Bridge and Building Foremen D Foundry Work C Bodermaking C Combustano Engineering C Kugue Running C Marine Engineering C Steam Electric Highway Engineering G Mechan cal Engineering C Mold-Loft Work C Patternmaking C Reading Shop Blooprinis C Sheet Metas Drafting Lumber Benier Reading Structural Blueprists Steam Engines E Secretarial Figure Lettering Secutary Engineering 2 Spenish Structural Drafting Reading Shop Bloeprints Testile Courses Structural Engineering Cotton Manufacturing Htenngtaphy Surveying and Mapping Traffic Management Sheet-Metal Worker Bayon Weaving Watting Present. City... Hours A.M. tours Preiftett. Canadian residents send corpon to International Correspondence Schools Canadian, Ltd., Montreel, Canada, British residents send corpon to 1 C S , 71 Eugenou, London, W C E, England. DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES



REFRIGERATION

Air Conditioning and Refrigeration are among the great industries of today and tomorrow. Installations everywherein restaurants, shops, homes, etc., need service. Thousands of businesses are waiting for new installations. Today, more and more homes are being air conditioned. The Refrigeration and Air Conditioning industries are headed for greater prosperity and man who have the know bow" and experience should ride along.

Tain Now Before the Expected

Experts predict large demand for men to install and service Air Conditioning and Refrigeration equipment . . . Rise to the kind of job which requires a competent, tra ned man who can carry the responsibilities of installing costly equipment and maintaining it. If he knows the answer when he is called in for consultation, his reputation grows and his pay should grow also, Follow This Way to Knowledge If over and under 56, here's all it takes to get " - Inching wooders on ving from y fuers or by detroise their ate tamount of your type of to a market a state of the property of the control where though you should knowledge that in was industry knowledge that WANT YOUR OWN REPAIR SHOPT DADLING D Uhli 'ra " he eas y understood by mechani-c a " " " You gather perience when you can it you course Experiment, tools and per-sisted the east accomulate as you progress. Soor y amay had it what to set up your own shop. GET FREE FACTS RIGHT NOW! It costs you nothing to get all the facts about this great to Simply mail the coupon below this great to w .17 . you, without obligation the whole, strong story of what a shead in Refrigera-tion and A r Conditioning. Mail the FREE coupon now. Children of the last of the la MITILITIES

MTHLITIES ENGINEERING INSTITUTE

Chicago 34, 18. 1314 W. Belden Avenue, Dept. 398,

Please send me the FREE FACTS about opportunities in Afr Conditioning and Mechanical Refrigeration. I have marked the one that interests me most.

Air Conditioning

Mechanical Bufrigaration

A COR

TONE ... BTATE

Electrical ENGINEERING, RADIO AND ELECTRONICS

8 months intensive residence course prepares for technician, engineering aldes in communications, power, business machines, sales, service.

Theory and extensive laboratory practice, drafting. Graduates hold responsible technical and engineering positions. Approved for veteran training. 53rd year. Enter Oct. 1, Feb. 25, July 8. Write for catalog

109 Takoma Avenue, Washington 12, D. C.

ELECTRICAL SCHOOL





TRI-STATE COLLEGE B. S. Degree in 27 Months

Distinguished for technical Tid-year courses in ENGINEBRING Ciril Electrical Mechanica Chemical Hadio, Accounting and Secretar a Science EX SERVICE MEN can complete work here in abortent possible time

Special Prop Dept Also REFRESHER COLLEGE 56 Week I serous in Severy on least by Low tuition. Low living costs, Communical student body 42nd year Enter Sept., Jun., March, June Catalog, 385 College Ave. ANGOLA. INDIANA

increased salary, larger responsibilities, a real career in-stead of just a job three are to be had by the traced drafteman. I C S makes the way to thorough, practical training open to pee Cherk up and you'l) and that nearly every big name. American in engineering and production acquired experience at the draft up tward. Many of theth start it by writing for the I C S free book at Sand for it today? It can be the sport important act of your life.

taturautional Correspondence Schools, Dex 7832-L., Serneton 8, Pa.

TE B' NASW's reachyou HOW to CREATE ORIGINAL RECONS of home that you may SELL! Confer restains lessens and over 800 Histotrations. All for Only Send name and whitnes for free details.

RAYE BURNS SCHOOL, Deet. B. Set 5302, GLEVELAND, ONIO

ENGINEERING, Broadcasting, Servlong Electronics Aviation Marine & Postes Radio taught thoroughly, 48 weeks Engineering course equiv-

elent to 3 years' college radio work. All expenses sow. Co-educational Estatog upon request.
Valparaise Technical Institute. Dept. 503 Valparaise, Ind.



Trained Artists are Cauable of Earning \$30, \$50, \$75 a week

Use Your Spore Time to Prepare for a ONE complete home study course. No previous Art experience necessary—we teach you step by step-hundreds have profited by our practical method TWO ART OUT-FITS FURNISHED Full information in co.orful PREE BOOK Art for Pleasure & Profit -tells all shout our course service what our graduates say and commercial opportunities for you in Art

BOOK EIVES

WASHINGTON SCHOOL OF ART Send me your booklet and full particulars about

Garage

ACC

THURSTAIRUN

TRAINING

Since 1927



SUPER-POWERED RANGE! BRINGS DISTANCE (LOSE-UP)

Here is the most remarkable after that we have ever made. Now you can see most everything you want to see . . , at the ballgame . . , beach sailing . . , nature study . . . stars . . . races. Bring distant objects so clearly close to your eye that they will seem almost near enough to touch. Why feet frustrated and baffled by samething for away that you want to see in full detail? Why be limited in your vision when you can multiply it 13 to 15 times with this amazing 3 super-powered lens GIANT TELESCOPE, and the magnification does it like magic This new telescopic invention is a mirotle of mass production economy and engineering legenwity. Mode to last from available war-time materials, it is the equal in performance of lefescopes that sell for as much as \$15.00. Think of the wanderful fun you can have by extending your vision 30 miles in full, clear detail. Read on for full explanation of this really remarkable invention.

IDEAL FOR SPORTS!

Don't must half the game, the finish of the race... the winner of the beauty parade... the delaits of nature study. This miracle felescope will give you the most minute details... bring them close to your eye, There isn't any autdoor sporting event that you can't use one of these telescopes to improve your vision. A seat in the grandstand will become a box seat when you're corrying this SUPER-TELESCOPE. Order yours today... and don't miss a play.

A PRECISION INSTRUMENT!

This giant telescope is not a toy . . . definitely not! It has been made with the ceretal precision of telescopes selling at much higher prices. Each of the 3 high powered lenses have been ground to precision by experts and carefully mounted to insure clear, for-reaching vision. Made of available war-time meterials in mass production is the only reason this telescope can be sold at this low price, Adjustable to distance and perspective. Horry and get yours.

S DAYS EXAMINATION

Suct send coupies with \$3.00 and get your GLANT TELESCOPE and FREE CARRELING CASE pastings path. If you brefer just the coupies out get yours (*0.0 at \$2.26 plus (*0.0 part pertage charges, if not satisfied, return in \$ days sed your partition price will be refunded bred coupies today! Inventor Carp P O. Bon. \$0.1 Church \$4. Advice, New York 6, M. T.





HIVENCO CORP. Bopt T-0009 P.O. Box 281, Church Street Americ Now T. E. N. Y.

I am enclosing \$3.00 Send TELESCOPE and FREE CARRYING CASE immediately. You pay pusings, I can return to 5 days for full retund if I am not completely calleded.

Bend C O.D. I will pay postman \$2.96 plus new C O D and postage charges on arrival, (Same money back guarantee as above)

ADDRESS



SHOP METHOD HOME TRAINING

By a Real, Established Resident School

Don't just envy the man who is making such a success in Radio. Don't be on the outside looking in on America's next great industry -F M. Television and the worder world of Electronics. Get in there yourself, on the ground floor, with a fine, well paid job or a lifetime business of your own. This AMAZING NEW TRAINING SYSTEM THAT DEMONSTRATES BY ACTUAL PRACTICE makes it possible for you to take your place quickly and with absolute assurance in this great and growing industry. For details send the coupon below

This is the practical, and sure way for you to get the training and experience necessary for a successful career in Radio. Television and Electronica Here is a fully tested and approved method-simple. direct, easy to understand and put into practice. Pill out and send the coupon on this advertisement for a test lesson to prove to yourself how different, sare and affective this course is.

Results Quick and Profitable

No longer do you have to think of Radio as a great mystery—Television as some-thing complicated and Electronics as vague

and technical. Here it is presented as simple as A B C and backed up with down-te-carth experience methods right from the National Sheps and laboratories. This training is so practical YOU START EARNING GOOD MONEY ON THE SIDE AFTER THE FIRST FEW LESSONS.

You can get such training only from National Schools because only National—one of the oldest and best equipped technical trade schools in the world—has the shops where instructors work with stadents and technicians to bring you—right in your awa heme—in your spars time—the kind of instruction and practice that necessary definite progress right from the

to a per the distribution of a per tail of and part to the series of the



Above Skilled as ructors at Nation believe a deve p g the most effect ve training methods and tryire + em ou Testing

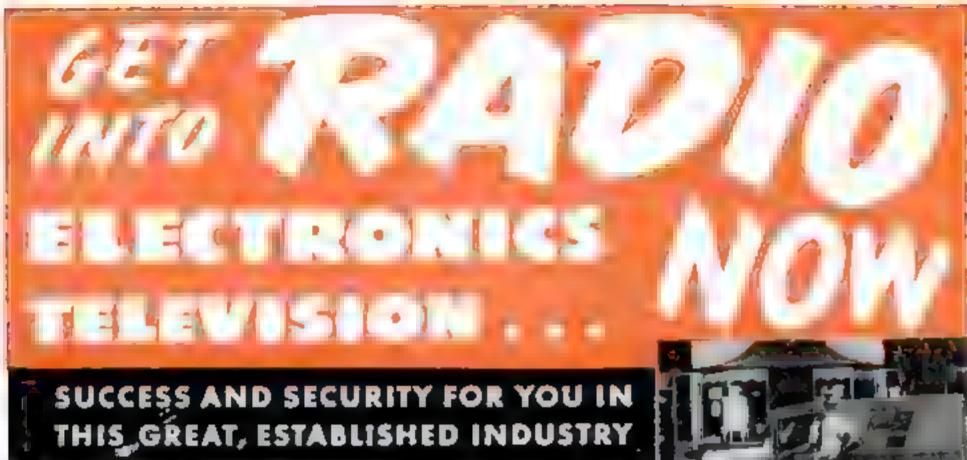
Righ Testing new electronic equipment at National before releasing to to studen a

struments signs generators—a [f i] slied, actual operating sets with your National equipment. In in a way voq really do learn by doing You ee to be a REAL EXPERIENCED TECHNICIAN The test leason that comes to you will show you how this is pos-

Here is some of the electronic ed ipment that is furnished at no extra cost with your course of National training Build a nig long des-

takes super eterodyne and other types of modern receivers, testing in-

> COUPON MAIL THIS MARK AND



Pace factat Radio is one of the country's great, fundamental industries with a volume of over \$5 (88) (88) (90). It demands tera of thousands of oxified maintenance pen, asshed operators, technicians every where, Cavilian production and up-keep has been practice y at a start of the error, the war Right new and for sense to come RADIO WORK IS COUMING as never before in history

F M , Fac-Banne and Television are in the ? placey but they are only walling for mate-Can suply a bank se product chi she are baperts est rommer than a half off in police p these trads RISHT IN THE START

b entropies is four I in nearly every industry and in many new bomes. Electronics will be the wonder worker of the future and so provides good pay jobs for men who know its basic principles.



What will you be doing when you hang up your uniform? - when your war job folds up Before you gamble your future SEE POR YOURHELP WHAT NATIONAL TRAINING CAN DO FOR YOU Send your coupon now.

Above: As a National trained THEN YOU CAN be YOUR OWN BORKstart a floorishing beamean of his own on little or no capital lits what you KNOW that counts. Left In industry the briter lobs and the better pay a c he man who knows what a s line in Rudio. Televis on and her spece

the fatted now You may be closer to your roal than you to your roal than you tpink In a few abort weeks you may be making your first money as a radio (echnician perhaps laving the foundation of YOUR OWN PROFITABLE BUSINESS FOR A LIFETIME OF SECURI-TY Take the first step now Reach out for opportunity, Fill in and mai) the coupon here, at

Good Jobs Go To National Trained Men

Share in the success of National graduates, Joseph Grumlich Loke Hinwaths writes: My latest offer was for \$5 000 00 as Radio Photo Engineer but I am doing wall where I am and I am decolv indebted to National

techn leisna.

Learn a trade that will support you always anywhere you go. Cash in on the demand for Radio. F.M. Television and Electronic operamaintenance men, supervisors and



Kolb. Perry worked in a hardware store while getting started in radio New he accurred more than a hundred sets month at a good yound income

H W Schreeder etatloned to California at National and new 1 know it to my best chance for getting shead in



Robert Adomaca Restocy Nebraska Na. Hotal graftiate has two radio jobs makes double pur as an instructor and as engineer at Station EGFW



Trained Men Wanted

The man who really knows modern Easte is in greater demand today than ever before—not only in Radio proper but in Television and Electronics—in Aviation, Transportation. Communications. Good into are wide spen, WAITING FOR YOU, in the production, operation and maintenance of modern electronic equipment—in radio stations, in hundreds of industries—in homes theatres and studios. Good sound training in this important field is absolutely necessary And now National Echools brings such training to you so matter where you live or what you may be doing—not only the fundamental theory but the actual experience that comes with knowledge shop practice and weeking with real equipment—demonstrating each step with first hand knowledge. Only National can offer you such practical training only National has the plant to back it up Sample this training yourself MAIL THE COUPON FOR A PREE

THE FACTS

MATIONAL

103 ANGELES JE CA FORN A EST 1103 MAIL OPPORTUNITY COUPON FOR QUICK ACTION

National Schools, Dept. 9-PS 4000 S. Figueron Street Los Angeles 37, Colifornie

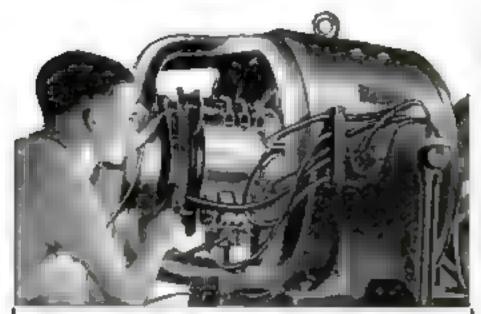
p we asset age pr punts on premy pool cuttl)

Mail the free the Sample Lesson and Opportunity Book. I understand that no salesman from National Schools will call

Name..... Ago.

Zone...... State...

Mailir



ON REAL MOTORS. GENERATORS. ETC.

Trained Electrical men are needed now. It's not how young or how old you are. The question is, are YOU trained to hold a good job today-and a good job with a real future—in peace time. COYNE TRAINING is easy, practical. Located in Chicago, Coyne has 46 years experience training successful men. Mail coupon now!

"Learn-by-Doing" in the Great Coyne Shops Get ready for a big fut are the quick Coyne Way-by nctual work on full-size electrical equipment, not by correspondence. Learn house-wiring, motors, power plants, switchboards, auto electricity etc. Be an "All-Round Electrical Man"—for big opportunities.

Train First—Pay Later

My "Pay-Tultion After Graduation plan enables you to get training first, and pay for a for tuttion in easy payments after grassian less if you need pertition work to help defeay expenses while here, I'll help equipped to train these

you get it.

Lack of Experience No Barl

Many of my students have never had Electrical experi-ence. Others have had experience in one or two branches but training for the better jobs. So whether or not you have had electrical experience you name Coyne training.

Get My Free Book!

Let me send you my big illustrated book showing how I help you get the training you need for a good Electrical job. It a FREE no obligation no calcaman will call. Send the corpon today! We also have facilities for men with physical disabilities whether due to war or other causes. Check coupon for details.

H. C. LEWIS, F 500 South Pauline Street.

Supt. 45-73, Chicago 12, III. H. C. LEWIS, Provident, Dept. 65-7), COYNE ELECTRICAL SCHOOL 500 S. Pauline St., Chicago 12, III

equipped to trate these

who qualify for training under the G. J. Hithor Rights Check esupon for special G. J. Bulletin

EXTRA TRAINING

Industrial Electronics and Electric Refrigaration

At C Brown

Now Included.

No extra

cost for

valuable

extra

training

PA - 01 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	
Send me your Free Book. Tell me about your EXTIINDUSTRIAL ELECTRONICS TRAINING at no ext	LA
INDUSTRIAL ELECTRONICS TRAINING at no ext	78
cost, and your "Pay-Tutton-after-Graduation" offer	
📋 Send Special G J Bulletin 📋 Send Physical Disability detail	la.

📋 Sead Special G J Bulletin 📋 Send Physical Disability detalls	 					 				
	Se	ad Sp	pecial	G I	Balletin	Sen	d Physics	Dia	mbility	detalla

N	Ä	м	ĸ	
			_	-

ADDRESS

CITY

STATE

Learn to Service and Repair ELECTRICAL APPLIANCES

Learn to be a service mechanic on all types of electrical and prepare now for a permanent future, appnances and prepare now for a permanent future, independence and security operating a business of your own. You won't have to worry about losing your Job when the next depression comes if you have your own electrical apprance repair business. There is always a demand for repair work—and it can't be done by a machine. Our practical, easy to learn home-training teaches you how to repair washing machines, vacuum cleaners, stoves, ismps motors, trons etc and how to do house wiring. Also how to start your own business on little capital. Write today for PREE is ustrated booklet which will explain in detail. No obligation. No salesmen will call will call

PACIFIC TRAINING SCHOOL 4701 W. Pice, Dept. AS-7, Las Angeles &, Colifornia

YOU CAN ADVANCE IN



Plastics use be the next great industry . swiftly and largely as the automotive, radio and aviation businesses. Arresdy it is an important industry and a grow-ing one. With L.O.S. true ng. you can take advantage of the many opportunities in Plastics today. At the same time, you prepare for the test possible too of tomorrow. Write for the free booklet containing full information? Do it right now!

International Correspondence Schools, Box 76324, Stranton S. Pa.

corn nie a, capte writing or fency presidental writing for advancement tight to built awa house during and happy to Penning to see to attempt what of of player are the as a real country to the area of the four time of the country to the country TEVIS HOR 25R CHILLICOTKE MO.



TATIONAL For THOONAS AT LIMB and LAB IR A Se Se St. of strangers through the Set the at dentale wind it is frequently fed A county only and the order to a frequently for FRET Burning and and but intivide a lattice

AMERICAN EXTENSION SCHOOL OF LAW Dept 57 % 646 N Michigan Ave Chicago 11 111.

earn LANDSCAPE GARDENING

A thorough, interesting, home study course for those who wish to become LANDSCAPERS, CARDENERS, DESIGNERS etc., for profit or pleasure. Write today for PREE INPORMATION to Dept. Phys., 755 20, Presdury, Les Angeles, Cal.

BOOKS FOUND

What books do you want?

Lowest market prices on all books. No charge for locating old books, HARD-TO-FIND or OUT-OF-FRINT

SEARCHLIGHT BOOK CENTRE 22 East 17th St. New York City 1

TRAINING -SECRET INVESTIGATIONS - FINGENPRINTS

INTERNATIONAL DETECTIVE SYSTEM LTOI P Manroe St , M E., Washington, O. C. 18

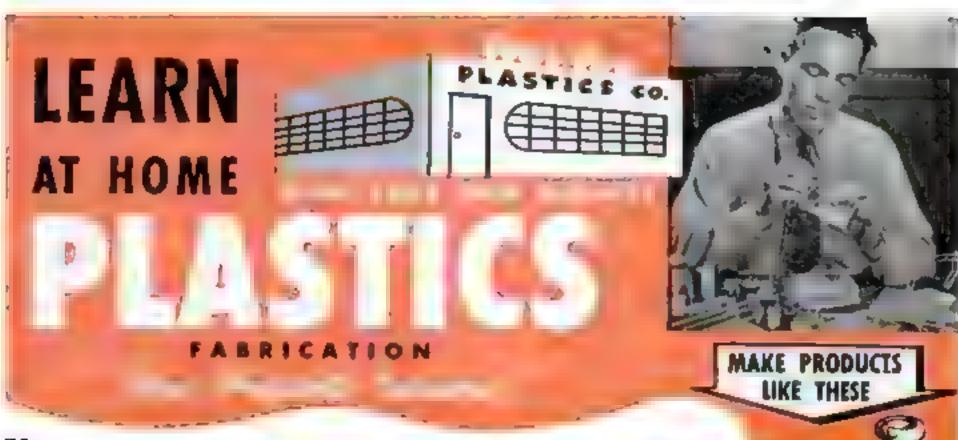


with no known talent, paint exact oil or charcoal libenesses. Study the cridence in new 42 Portrait Brochure of samples. Many cars while learning. Briok in free on request.

STUDIOS

121 Mesoment Circle, Room 239, Indianapolis S. Ind.

Nemerca	****			+		
Street					115	
Citte			Riele			



You'll really enjoy learning plastics this new, interesting way! For you'll actually make beautiful, useful plastics articles during your home study training with Plastics Industries Technical Institute.

exciting age of plastics is here! Demands of war have caused phenomenal growth in the plastics industry—creating exceptional opportunities for those who know plastics. If you are a person with an eye to the future, you won't remain on the outside looking in—you'll want a choice position in the growing, expanding plastics field—or a plastics business of your own

WE SUPPLY MATERIALS—For your interesting and practical work with plastics, we supply handsome, colorful, transparent rods, sheets and tubes of plastics from which you make useful, attractive creations. You saw, cement, machine, buff, form, dye, decorate, cast and laminate various types of plastics.

You also design your own plastics articles — develop your own ideas — express your originality. Earn money while learning.

A COMPLETE COURSE—This practical training in plastics fabrication is only one part of the Plastics Institute home study course. In addition, you learn about the many types of plastics, their manufacture, characteristics, properties and uses—intensive coverage of molding and mold design—testing and cost analysis—everything to help prepare you for your place in plastics

START YOUR FUTURE TODAY—Mail the coupon below now! We will send you an interesting, illustrated free book let with valuable information about plastics. We'll tell you how, at small cost, you can prepare for a future in this important industry while carrying on your present work. Don't put it off, Clip the coupon and mail it today!

VETERANS, ASK ABOUT G.I. TRAINING

Dept. PSS-9, 122 E. 42nd St., New York 17

Dept. PSS-9, 221 N. La Salle, Chicago 1 Dept. PSS-9, 1601 S. Western, Les Angeles 6

SPECIAL RATES FOR SERVICE MEN

Castics for s

Plastics Industries Technical Institute. 221 N. La Salle St., Dept. PSS-1, Chicago 1 Mail in Envelope or paste on penny postcard

Gentlemen: Please send me the booklet "World of Plastics" and information on your training program. I understand there as absolutely no obligation.

Veterans: Check for special information.

If under 18. Check for special booklet.



SO IT NEEDS FIXING

By S. T. CHRISTENSEN the "Fix-it Man"

"WELL, I guess I'm the fellow to see, for V I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And, "doctoring," I might add has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

What to Charge?

At first, I let the owner decide the charge and, frankly, I was amazed at what I carned per hour. But then, when one figures what initial costs are involved in buying most electrical appliances, one can readily see that spending extra dollars for repairs is well worth while. Before long I was making more in my spare time repairing than from my regular job. The result . . . I went into business for myself. When war came, business boomed, for new appliances were not available.

For a while, repair parts (needed on some jobs) were a little difficult to get. But that

situation seems to have adjusted itself for many repair parts have today the high priority rating of AA2. After all, we must provide for the health and well-being of our civilian population.

The Future Offers

Friends ask me about my future. And, I think I've got a grand one. Age is no handicap in repairing. I have in my files enthusiastic letters from repairmen ranging in age from 18 to 79 years. After the war, we're bound to see hundreds of new products on the market . . . products that the average person never dreamt of. These new products and our old appliances are all going to need at some time or other "fixing." Well, I'll still be the fellow to do it. The field open for appliance repairmen is unlimited. I don't worry at all about too much competition.

If You Are Ambitious

To the contrary, I've prepared a complete course, chuck full of simple, easy to understand photos and drawings and written in the same non-technical language as this article. I know the course is good, because I have hundreds of men all over the country writing to me telling me how the course has helped swell their pockets with cash. If you too want to prepare now for your future, I suggest you read the next page and send me the handy coupon."



PREPARE NOW FOR THE FUTURE

If how in war work, start your home appliance repair business NOW in your spare time and be set with a business of your own when the war is over. You don't need elaborate fixtures or expensive equipment to be a successful repairman. Operate from your garage, basement, vacant store, etc. Work as many hours as you wish the home appliance repairman is his own boss, It is a profitable occupation for on many types of repairs it is not unusual for a repairman to charge on the basis of \$5.00 to \$6.00 per hour. Don't gamble with your future—learn a trade that will always support you. Remember, as long as electrical appliances are used, there will be a need for electrical appliance repairmen.

If you are at all mechanically inclined—can hold and use tools—then you have all of the qualifications required for becoming a big money earning home appliance repairman. It does not matter if you have not had a great deal of achooling or had previous experience along these lines-WE WILL TEACH YUU, Age should be no barrier—nor should any minor physical handicap.

New Course Tells All

Profusely Illustrated, our new course shows you in simple casy to understand language and drawings how to make each repair on refrigerators, vacuum cleaners, washing machines motors, etc. Explains and given you a working knowledge of electricity welding nickel plating etc. Shows you how to build the power tools you need and how to solicit and keep business. coming to you. Not a theory course but an honest to goodness course written by and used by repairmen the country over. Price of course is so low that the savings on your own household appliance repairs will quickly pay for It. Act now! Mail the handy coupon below today.

----Read What Our Students Say About Course---

I really believe your course the best investment & mechanically minded man can make.-Claude E. Allen, Indianapolis, Ind.

f have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some rears ago I have learned se much more through this course I would not purt with it .- Charles Schwart, Bamil-

ton. Ohio.

The Course in Appliance Bervicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that god told the truth when you said that it contains quite a bit more information than I hargained for, 🚗 P J. Bretl, Sebring, Obio.

I am a mechanic for the Western Union Telegraph Oo. Three days after recerving the lessons in refrigeration I carned the exact cost of the course. - Henry & Lee, Washington D C

I work day times at the shipperd and after 4 00 PM I operate from my cellar and garage I avorage \$10 00 to \$15 00 clear every day Waster Hanhy, Brockton, Mass.

	GET STARTED
	Serie Carriera
THE IN	
	and the same

CHRISTY SUPPLY CO.
2835 N. Control Ave., Dept. D-3281
Chicago 24, Illinois

Please send me free illustrated literature about America's Pastest Orowing Industry—ELECTRICAL APPLIANCE

<u>(</u>

It's YOUR future-Make the most of it!



Start <u>now</u> to earn the bigger pay in electrical repair

WAS there ever such an opportunity to get started

In electrical maintenance and rapaly—and at top-notch wages? Are you ready—with experience and ability—to cash in on it? Others are getting ust the sort of background needed—quick! practical—to handle the great variety of electrical maintenance and rapair work TODAY—from this well-known electrical library. You can too!

THE LIBRARY OF ELECTRICAL MAINTENANCE AND REPAIR

5 vals., 1826 pages, 1724 Westroliess

Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generators—to diagnose motor and generator troubles—to figure new windings for old cores—DC and AC windings—to test armsture windings—test induction motors, etc. One book is full of trouble-shooting charts that show quickly symptoms, causes, specific remedies, etc.

Take the first step toward improving YOUR future-

No money down-special price-easy payments-FREE trial

McGraw-Hill Book Co., 330 W 42 St., New York 18, N. Y.

Hend the for ten days' free enginest on the Alectrical Maintenance and Reyner Ellipsey if satisfactory i will send you be in in its days and \$2 ou monthly unit the price of \$15 00 is outd. If not wented I will return bushs postlaid 170 insure prompt chipment write plainly and this is all lines?

Nome Hamo Address they and State consumery Post &

PSM 9-45

This 176-page

FREE BOOK

is also your



GUIDE for the FUTURE

Prepare for peacetime competition. Let this free book help you it is issued by an organization known throughout the world for thorough engineering training. The examination subjects listed below are only a few of those dealt with Without obligation write today to Canadan Institute of Science & Technology, 351 Chester Building, 219 Bay Street, Toronto 1, Canada.

A.M.; Mech.E. Mechanical A.M. 1,E.E. Electrical A.F.R.Ac.S. Aeronautical

A.M.Brit L.W.E. Hatto and Telegraphy A.M.,G.E. Givil A. M. I Struct. C. Structural Automobile Mining

London Matriculation B. Sc. (Pure Science)

Canadian Institute of Science & Technology Limited, 351 Chester Building, 218 Bay St., Toronto I., Coneda.	
Presse forward us free of rost or obligation of any k 170 page handbook. ENGINEERING OFFORTUNITIES.	
Name	
Address as an an an analysis age	
Course Interested in	

TRAIN FOR KEY JOB OR BUSINESS OF YOUR OWN

REFRIGERATION AIR CONDITIONING

Millians of Order Volts Hood Export Service. Big After-the-War Expansion Will Groots Even Maco Opportunities, Approvad for Veterous "G. L." Training

A key job a successful business of your own—you can have either in this with), was hit industry. A serious shortage of service expects white in every branch the post was become will open thousands of new opportunities. Let ready for your big chance. We give you the practical training you need at home — and in nor big Chirologia shape, argue and much completely equipped in the country. No advanced behaving accorded. Our unique methods make everything wasy to grapp. We we trained thousands. Pay as you go, Quit when you want to Got the fail facts without abligation. Write TODAY

INDUSTRIAL TRAINING INSTITUTE

2150 Lawrence Avenue, Dept. P2-I, Chicago 25, Ill.

The MYSTERY OF RADIO

(HOW IT WORKS)

Binipities training procedure, by outlining I R.F. & superheterndyne principles. EXPLAINS the NETWORK of circuits (One at a time) of an AC-DC five tube superheterodyne system.

LEARN RADIO EASIER, FASTER

ORDER this practical training aid without risk. If not fully satisfied, return within 3 days for refund. Only 13. P. P. Send M. O., Bill or Check.

SCIENTIFIC RADIO SERVICE SYSTEM

MAKE MONEY CASTING HOME



of Plaster Casts quick, easy, Sell output to stores, nove ty shops, etc Enormous profits. No experience Very little capital needed Start in basement garage or workshop. Complete, simple instructions snyone can follow Start now while merchants are begging for murchandiss to sell Rush.

PLASTIC ARTS STUDIOS, R. R. S. Boyl. 46, Muncle, Ind.

"How to Make Money With Simple Cartoons"

A heak everyone who likes to draw should have. It is free, no obligations. Simply address

CARTOONISTS' EXCHANGE

Dept. 1449-D

Pleasant Hill, Ohio



Begin today Write naw (ne our Free Book, 'How in Beronne a Good Femmas.' It contains apresented need to be to appear time. For one for its year name beant to by writen and proposed proposed proposed for should wroung the Indepented TAMBLYN SCHOOL, OF PENMANSHIP N-425 Ridge Sufferng. Rancos City, No.

RADIO = ELECTRICAL ENGINEERING

ds 25

ELECTRICAL ENGINEERING. On good group of wide electrical head Mustra Very mode/standards. Theory made that RADIO ENGINEERING Extra non-course in radio public address, photos a retrict warh. Trains you in he paper pervise gaza, real vacuum tube trebatetas. Tuites warh. This either course. Deferred payment plan. Servicemen needed bedly, FREE Write for free contents of white carbon amendment, etc., the LINCOLM ENGINEERING SCHOOL, Box \$31-5-61, LINCOLM. WERE.



LEARN MEAT CUTTING At Home—In Spare Time

Get leto the vita, meet industry Cone is practical Home Training based on 25 years proven herture too methods used at Nationa's famous resident school Prepares you for higger pay as Meat Cutter supervisor market manager or those musey to your own store to us rapidly as your spare time permits top one Start N.W to turn your share hours into money Send for FREE building today. No obligation

Stational School of Meat Catting, Inc., Dest. 0-34, Tolodo 4, 0,

Learn **ELECTRONICS-**TELEVISION



ELECTRONIC CIRCUIT TESTING - Instructor show-ing students use of large Cathode Ray Oscilloscope.

RADIO TESTING AND SERVICING-Students Jearndag to locate troubles with modern radio analyters.

TRAIN FOR A GOOD JOB NOW that will also be a GOOD JOB IN PEACE-TIME

Don't be caught happing. Prepare for a good job now that will only be a good job with a real future when the war to over it you are not a trained many in may have a compete with collions of other untrained men. Get into a field that off in reas opportunities

in war times, prace times good times and bad times. The mendous expansion in Froquency Modulation and Television is predicted after the war. Radio-Electronics trained man are needed today when final peace comes.

Learn by Doing

RIGHT HERE in the SHOPS of COYNE-12 Weeks Training

Ill Finance Your Training

We train you on real Radio, Television and Sound equipment RIGHT HERE IN THE COYNE SHOPS IN CHICAGO. Whether or not you have had Radio experience you need Coyne all-around Radio Electronics training. Many of my students had no previous experience. Others had experience in one or two branches but realized they needed all-around training for better jobs and advancement.

If you need part-time work to help pay Hying expenses while at school, we will help you get it. Coyne graduates also receive a Life Membership with Lifetime Employment Service, free technical service and privilege of review without additional tustion charge.

MEN WITH PHYSICAL DIS-ABILITIES-whether due to war or other causes -- we also have facilities for you. Check coupon for particulars if you have a physical disability of any nature.

PREPARE FOR JOBS LIKE THESE

Frequency Modulation (FM) Radio Manufacturing Radio Set Serviceman Television Servicing Electronics Maintenance Public Address Systems, etc.



Industrial Entrywation you get ready for the better jobs in these great fields ... no additional tuttion cost IF YOU ACT NOW!

THE HOME OF COYNE



VETERANS! Coyne is equipped to train those who qualify for training under the G I Bill of Ridbto. Check coucial G. L. Butletin

H. C. Lowis, Proc.

ELECTRICAL SCHOOL RADIO-ELECTRONICS DIV.

Paulina Street Dept. 65-4H CHICAGO 12, ILLINOIS

Real Opportunities for the Radio Trained Man

Prepare for jobs as assembler, inspector and trater— Radio sales or service and install atton work etc frontes television, sound work assembleration auto-ratio, etc Many opportunities in the vast Radio-Electronics field.

GET MY BIG NEW BOOK

It tells all about my big Chicago shops and my plans to help you get ahead, l'acked with facts and pictures of students at work in my shops. Mail coupon for this Big. New Book new! Coupon will also bring details on how I'll Finance Your Trainfacts on how I help you "Face-While-Learning ... information on FREE EMPLOYMENT SERV.

ICE FOR LIFE . . and other plans to belp you.
ACI NOW TO MAKE
SURE YOU GET MY
GENEROUS OFFIR. Sending for this interesting free book can be your first big step to success. No abligation. No enlesman will call. Mail coupon today. H, D. Lewis



H. C. LEWIS, Pres., Radio-Electronice Div.,
COVNE ELECTRICAL SCHOOL,
Soo S Paulina St., Dept. 45-48. Chicago 12, Ill.

NAME

ADDRESS

1 CITY

. STATE

Rich diggings for





The skilled patent draftsman is always in demand and his work is never monotonous. You can learn this profitable and interesting skill from the new book. MAKING PATENT DRAW-INGS by Harry Radzinsky for only \$3.00 It explains each step in making drawings for both patents and trademarks, with examples of all types of patents. Includes all U S. Pat Off rules and charts.

INVENTORS

This book will help you make sure that the drawings for your invention show exactly what you want patented, and in the exact manner required for acceptance by the U.S. Patent Office. Explains what so show so detail, what nor to show, includes many valuable pointers on how to avoid faults that might cause rejection.

USE THIS COUPON TO GET EXAMINATION COPY

The Macmillon Co., 60 Fifth Ave., New York II

Please send me a copy of MAKING PATENT DRAWINGS by Radzinsky (\$3.) with the under-standing that if I return it in good condition within 7 days my bill will be canceled.

Signed	
Address	

BIG BUILDING BOOKS

Learn to draw plans estimate be a live-wire builder do remodeling take contracting jobs These 5 practical profusely illustrated books cover subjects that will help you to get more work and make more money Arch tectural design and drawing estimating stee square roof framing construction, pointing and decorating heating air conditioning concrete forms and many other subjects are Inc uded

BETTER JOBS — BETTER PAY

Keep busy now at good pay and be pre-pared for after war building boom. Big opportunities are always for MEN WHO KNOW HOW These books supply quick easily un-derstood training and handy permanent reference information that helps solve building

UP-TO-DATE EDITION

These books are most optodate and complete have ever pub-Instrud DIT these many subjects.

Coupon Brings Eight Big Books For Examination AMERICAN TECHNICAL SOCIETY Vocational Publishers since 1856 Dept 9820 Chicago 37 III. Chicago 37 III.

You may ship the the Lada Date edition of your eight big books. Entit! Ing Par making and Lentracting? without any shillgation to buy I will puy the delivery charged only and if fully satisfied in ten days, I will send you \$2,00. and ofter that easy \$3.00 a month, sould the total price of only \$34.00 is paid. I am not obligated in any way takens I keep the books.

Address

State Please stack a letter stating your age acceptation, employer's name and address, and that of at least one business man as a reference. Men in service, also please give home address.

HOME TO MOUNT BIR



Animais, Heads, Pishes, Pets; to TAN Be a Taxidermist. Profit and FUN.

Hunters, save your valuable TWOPHIES.
Moont ducks, squittress everything Learn to
TAN for leather and fure. Wooderful HDSSY
Bave a NOME MUSEUM. Six PROFITS
mountly for others INVESTIGATE NOW.

FREE BOOK With 100 fine
game pictures.
HOW absolutely FREE Wetts TODAY.

Send Postal TODAY for FREE BOOK. State AGE.



QPPORTUNITY:

There's no limit to the chem at a chances for advancement.
In many a importance Experient is developed to great new industries. Established industries rely on the great new industries. There's no limit to the chem at a countries for agrancement. In many a importance Experient is developing grant new industries. Established industries rely on importance I C S training practical thorough chem this great field to you listraction papers specially written by mored chemical originates are listraction to provide the state of the Interuntional Correspondence Schools, finz 7832-L, Scranton II, Pa.

ORTHAND

treatment of A to b Surprising y on set 104 mill broget by mail the in leading offices and Civil Service Write for free bookiet, specialisting Dept 24098, 28 West 42 St., N. Y. 18

In Home or Shop



P52

Licented Concrete Specialists wanted No experience needed Make Calmaland concerts potpry without molds. New Jost cost parented nighted Cemetery products novelties tiles floors sie Resement lenkesel hit Other big pay projects Book at details free Mon only

NATIONAL POTTERIES COMPANY

For Store Pronts and Office Windows. Anyone can put them on Samples furnished. Genuine gold and aliver

MEYALLIC LETTER CO., 441 N. Clark, Chicago 10

To make Crawes, Pinten, Gridgework, etc., for Dentitie Lany practical way to learn mechanical dentistry at home in spare time FULL EQUIPMENT OF TOOLS AND MATERIALS INCLUDED WITH COURSE Law ledies Easy terms Write for PRES BOOK about the muney making profession that is not affected by the machine age. McCARRIE SCHOOL OF MECHANICAL DENTISTRY Food 54. Ocpl. 642 Philadelphia, Pa.

207 M, Broad 54.



Buy War Savings Bonds and Stamps regularly.

HOW TO THE YOURSELF A GOOD LIVING ..

HE only way you can GUARANTEE yourself a good living, come good times or bad, is to KNOW MORE than the average job-seeker about Something Important in the business world . . . something employers will pay you well for, or that you can use to set up a prosperous, independent Business of Your Own. • • • Here are listed just a few of the present and Post-Wer OPPORTUNITIES available to you. Here's your chance to choose the kind of occupation, trade or profession you'd like to masterhere's that all-important practical information you require. • • • Just mail coupon for big FREE 100-page Success-Catalog showing thousands of ways to better your condition and IMPROVE and ENRICH YOUR LIFE.



Real Estate SUCCESS... be a professional man

Practical training on how to run a profitable Real Estate Bustness of your own. Illustrated self-study lessons on farm and suburian properties, fowntown operating. Gain a working knowledge of mortgages, listings, sales techniques, appraisant, property management, commercial lessing, contracts, etc. Real estate is the form-delion of all wealth? BUBH COUPON BELOW for NEW facts you should know about your future in real estate. There's no obligation.

training. Authoritative step-by-step instruction on servicing bousehold refragerators . . . how to install, operate, repair. Easy-tofollow illustrated directions on troubleshooting, parts suplacement, testing. Coverng lek-freezent a kekera wa er endera freem, ast con the energy systems etc.
Amaz nglow tistel Free to over pon

AUTO Mechanics
Let this Precion, Low-Priced contras get you

started in the auto repair trade. Good mechanics make big money NOW . . . and have a great fun genral Belf training lemons show you exact y what to do and how to do ut. It teaches servicing on all makes of care , adjustments tune-upe, etc. Clearly written and illustrated by expert engineers. Satisfaction or a re-fund Mail couper new for FRFE details.

Carpentry ~ Building ESTIMATING

There's a great future in the building trades for trained men. Up-to-date leasons how to pun, build, remodel houses, instructions stair building, steel aquara, couling, paint ng decorating, etc. Brad for full information FREE, Use coupon.



MAIL ORDER BUSINESS YOUR BIG OPPORTUNITY!

Heleson course on proved, tested, up-to-data, profitable methods. Amazing treasure-home of best mail order plans and practices. How to start your mail order business on a small one-man scale, how to keep it growing more and more profitable months after month. Honey making facts, Free sensational details. Mail Coopers;

NSURE YOUR FUTURE -- Mail This Compon How! On this coupon check the subjects that interest you. Our world-famous copyrighted Socress-Catalog will bring complete details, FREE . , no cost, no obligation,

CO, Dept. 4001, CHICAGO 4, H.L.

Watch & Clock Repairing

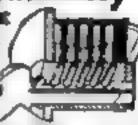


Learn of home in your carre time. Propare for a Happy Fotore of prosperity, security, and get a hig-pay job new. Fascinating! You can sare while you have. Fascilent field for part time work at home. Practical Course in HOROLOGY. Therough self-instruction truiting to American and Swiss watches and clocks Special section on alarm clock repairs.

Learn-by-doing instruction method. In-teresting, Quick, Easy No previous ex-perience needed. Watchmaking is basic training for Aircraft Instrument Work and other actenuite precision jobs. Fast-growing field ... bly opportunity. Mall complete information TODAY

Locksmithing & Key Making

PRACTICAL UP-TO-DATE COURSE How to pick locks, de-code, make master-keys, repair, install service, etc. New, self-instruction lessons for every handy man, home-owner, carpenter, mechanic, service station operator, fix-it shop, hardware dealer, or gunamith. 63 Easy Illustrated Lessons LOW PRICES Satisfaction guarant ed or money back. Write now—no oblimation!



Practical RADIO Service SELF-INSTRUCTION COURSEteaches you

the practical side of radio... as a time at operation, trophic-shooting. No previous keeps like becomeny, large, clear if a time is, disastants charts, etc., interesting Steady Works & tay a radio repair shop of your own-or preparate for houring industrial chartrantes. The use how to- low it course proge you all for fundamentage including may a ma are, reve with a the problens, are wers St at up to date Common below will bring you full inform a or you wall want. Mail it is today, Nove in the



What to INVENT how to INVENT

PRINT READING Practical course for the wideewake practical men. IDEAS . how to get them, develop them, protect them and promote them! Expert information on how to turn your imagina-tion into money. Plus (liustrated self-study lessons on basic mechanics) movements and devices. Mail soupon below for PREE details. No obligation.

STATE.

FREE!	100-page	book	mail	this	now!

NELSON CO., D	MPT. I	MO1. 321 I	. WARASH AVE.	CHICAGO 4, ILL
Please send me-	Free, w	Shout obligat	don-treatrated Sec	cess Catalog containing No salesman will call
Microston shout	the put	ject (sub)ect	 1) I've checked below 	No salesman will call
Constitution of the consti				

	Watch and Clock Repairing
\Box	Practical Radio Servicing.
\approx	Mail Order Business
	THE CITY DESCRIPTION

	Locksmithing	Ľ
Ю	Real Estate.	
	Carpentry,	

ZONE

	Metrigeration,
	Auto Mechanica
	Itreartions,
_	

ADDRESS

Buy War Savings Bands and Stamps requierly.



Good Income. Pleasant Outdoor Work. Now Easy to Learn—In Spare Time at Home

TREMENDOUS OPPORTUNITIES! U.S. Housing Admin reveals 12,600,000 homes needed. Vast population shifts, Govt loans to veterans, higher incomes on farms, in towns, cities—all mean tremendous expansion.

Prepare NOW to cash in on big profits. Learn in spare time. No need to give up present job. Start in "on side"—then build up full time business as your own boss, pleasant outside work, your own working bours.

Mail Caupan for FREE BOOK

Practical home study course prepares you for this money making, big future business. No previous experience needed. FREE BUCK tells now you can quickly teasy to make excellent income Mail employ today No cost no chiga tion no salesman will call. Natural of Real Estate Team no, Dept. 128–126 Bedford St., Sigmford I own.



Rend FRI	AK BOOK	describing	course	Na jules	an h	to call.
Name.	1618 -81861				÷ ·	1711
Address-	41		n-	11 · · · · · · · · · · · · · · · · · ·	verne	



The Sig Field in Postwer Aviation

Transportation by air is still in its infancy-your apportunities for success to Athline's MAINTENANCE will keep right on growing at thousands of new truth and frader time planes start to carry more than 20 million passengers and thousands of lone of air cargo every year. Specialists in airlines maintenance are required for every plane in the air—the more planes, the more opportunities for you!

Come to Los Angeles for your training-qualify for such a career at Aera Tech, where you get the benefits of modern field and shop equipment, and close contact with the agrees industry

VETERANSI

SERVICEMEN!

Aern Tech is among the schools approved by the Vererans Administration, so that discharged venerate who arrend over aligible for educational littuefer under the G L Bill of Rights.

	INDUSTRIES 1 Son fernoade I			
			es severas declari	below
1	Busine Aircraft		or Aircraft record factoristics	
	Airline Maintes - Engineer	D Anne		
1	— Airline Highs — Engineer	Agree Empir	negation! sent	
-			494	



RADIO, SELECTRONIGS and YOU!

trans are big rewards in the communications line for the Barlo man who has the answers! Too, the equipment that has made Radio communication possible is functioning new in other rewarding fields. Electron tubes in a instruction of Electron tubes in a lineary promise a wists new World of Electron.cs.

I. C. S. has a variety of Radio Courses and a great new standard Electronics Course. Write for booklet, pick your Course.

International Correspondente Schools, Ber. 7032-L. Securius S. Pa.

AW

STITUT AT HOME for PERSONAL SUCCESS and LARGE EXENINGS 36 years expert instruction over 100 900 students enrolled LL S Degree awarded Al. texts furnished Easy payments Send for FREE BOOK - Law and Executive Guidance

AMERICAN EXTENSION SCHOOL OF LAW Dept. 37-5, 546 N Michigan Ave., Chicago II., 18.

STUDY AT HOME

With A Chartered Educational Institution
Courses is an engineering: Electrical, Civil, Machanical, Braftley
Architectural Bloom Astonautical Radio, Structural Mining Industrial Highway Petroleum Marina Chemical,
Courses in Autt and Sciences Philosophy Educations Letters;
Public Rests Medical Jurisprudence: Psychology; Bestology, Physics;
Chemistry Groupy Pop Science Theology; Law, Business and
Pammetre Accounting Mathematics; Bisitation: Agriculture
Building Business Innerported, 613-55, Revides Soid, Ethings, 48, Mining

Trains MAGAZINE

The illustrated mouthly ubout railroads

Buy wer bonds now, ... After the war use them to see America on the last comfortable freing of tomorrow. Read Trains Magazine to Jearn what the rationals are doing and how they do it Send 25 cents for recent save.

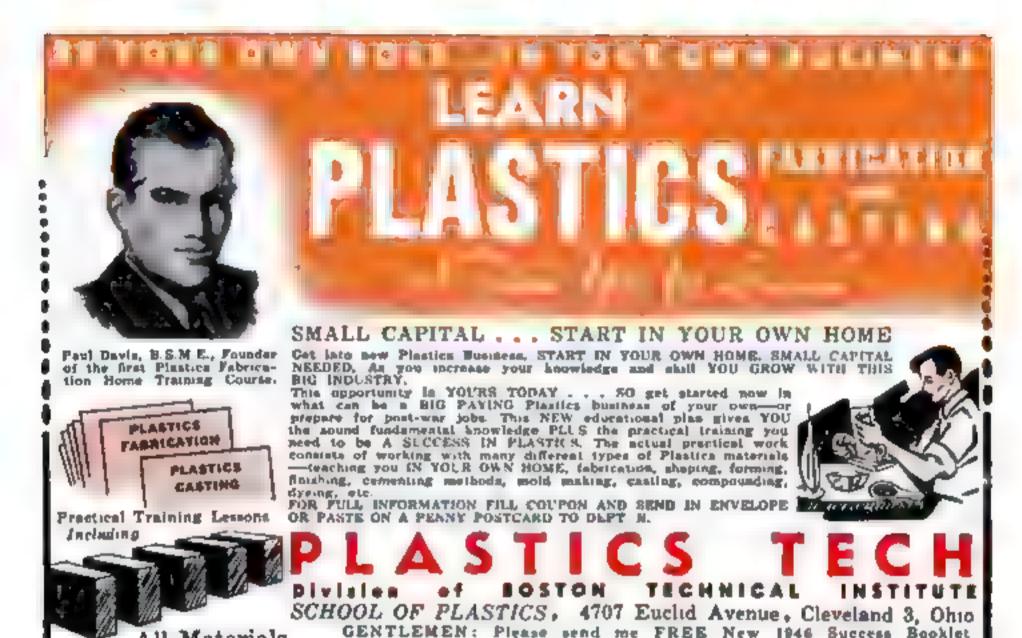
TRAINS MAGAZINE, Dept. N. Milwaukee, 3, Wis.



PREFACE NOW FOR A SETTER MAN. Begin now to turn spare time into money. Become a draftsman with opportunities for advancement. Be ready to qualify for a good paying job as industry turns to peacetime production. If you are now doing routine drafting work, prepare now

If you are now doing routuse drafting work, prepare now for promotion to a better job in your field. Send name and address today for FREE information.

7	
i	American School, Bost, D 5646, Dyenel Ave. at 56th St., Chicage 57
l	Name.
i	Street
Į	City, State





and

All Materials

Working Kits.

Complete

Three months after taking your course I STARTED TO PLAY FOR DANCES

STREET ____P. O. ZONE

CITY STATE

"Before I took it I didn't know a note of music"

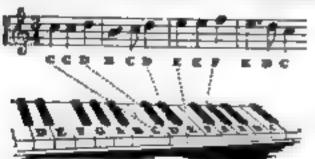
Writes Miss Resie Montemorro of Vencouver, S. C., Conede

"Words cannot express my feel ness to the if S School of Most. Be fore I took your course I deln't know one note of mosts. Three months later I started to play for dances. It has a crear expranation in every lesson." Mass Rosle Montemarro.

You, too, can learn your foverite instrument quickly, easily, for ONLY 7c A DAY

This letter is typical of many we have from pupils Thousands who didn't know a note are new playing their favority instruments thanks to this simple home study way to learn music for safe Te a day. Learning music this famous Print and Private way is easy as A B-C. No long winded explanations to this same eventures. You play real tunes by note right from the start. If interested send for Free Bookiet and "Print and Picture" Sample biall coupon today, to: U.S. School of Music, 59 Brunswick Bidg. New York 10, N.Y.

See how easy it is! "My country 'tis of thee, sweet land of liberty"



Look at the music. The first note is "C". Follow the dotted line to the keyboard and locate. "C" on the plano. Find other notes the same way. Strike notes as indicated and you'll play the melody of America.



SUCCESSFUL 47TH YEAR

U. S. Schmi of Music

EP Brusswick Bidg. New York 10, N. Y

Please send me Free Gooklet and Print and Picture
Sample. I would like to play insurament checked below.

France
Sample of Music

France

Name Address

City ... State

Sect 2e-Stock Coupus on Penny Pusteard

Contriument?



 New homes and other structures to be built after peace returns will provide a tremendous number of wellpaid jobs, Men trained in Architecture, Drafting, Contracting, Carpentry and related building trades will cash in BIG on their knowledge and skill. YOU can train in apare time at home, at low cost, for a big-pay job in this rich field. American School can help you to success just as it has helped others during its 48 years. Check, fill in and mail coupon NOW for FREE information,

AMERICAN SCHOOL, Copt. 8646, Grenethye. at Shinks., Chicaga ST. 18. Send me FREE information about your special training plan

covering subjects checked below.

- Architecture and Euriding
- D Draftling and Beeign.
- D Contraction
- Practical Plumbing
- D Air Canditioning
- finfrigeration
- Electrical Engineering
- D Automotive Engineering
- Diviset Engineering
- II Mechanical Engineering
- ft Plastice Engineering
- D Aviation D Redie
- Business Management
- E High School Courses

Address

JUST OUT! NEW FROM COVER TO COVER

GUIDE CONDITIONING



4 Backs in One! Covering: Basic principles, Bervining, Operation, Repair of 1 Household Refrigeration

Aprola Refrigeration Colts

t ommercial & Industrial Refrigeration 4—Air Conditioning Systems A gold mine of emerical important facts for FNGI-NFI RS, BERVICEMEN & THE THE

Good Book in a Good Friend? Here you have at your Popers' ends a Complete Library in UNE VOLUME, the necescata you have been look-ing for on: MODERN I NITS, SYSTEMS & MACTUNES, REFRIGERANTS, tochuding Freen, Lockers, Water Coolers, Quick Freezing & Air

Conditioning Systems. 12-0 Pages, 46 chapters all Fully Blustrated & indexed for Ready Reference.

ANSWERS YOUR QUESTIONS Get This information for Yourvell, Mail Coupon Today, No Distration Union Settinged, ASK TO SEE IV.

COMPLETE ● PAY ONLY \$1. A MONTH ←

AUDEL, Publishers, 49 W. 23rd St., New York 10. N.Y. MAIL AUDELS NEW REFRIGERATION CUIDE for free examination. If O. R. I will send you \$1 in 7 days, these result \$1 monthly until gross of \$4 is paid. Otherwise I will return it.

Mama	 	 	 	 	
Address.					

Get into Good Paying



BIO DEMAND in Auto Body and Fender work. Start training now spare time at home for good pay work now and postwar. Practical shop experience included. U.E. I. Training covers metal work, welding, painting, etc. Placement service -or we will show you how to start. own shop. Behind U.E.L TRAINING is a large national organization founded 1927. Write today for Free Facts-No obligation

BUTO-CEASTS . UTILITIES ENGINEERING INSTITUTE 1314 BELDEN AVENUE, DEPT. 395X, CHICAGO 14, ILLINOIS

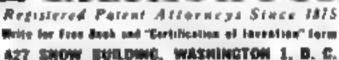
Win the degree of Pa.D. Teach the secret of contentment, happiness, Suite mental worries. Experience the revelation of truth, College, Individual help Write for FilEs, book CO. UNIVERSAL TRUTH. 5153-A Morth Clark St., Chisage. COLLEGE OF

Qualify quickly as Mark he or Tool Designer thrutigh space time nome study Many making \$100 to \$.75 a week Espanying ndustry calcing for more much ne and tool designers than available Rush name and address today for facts on Machine or

Tool Design State agr.

Inventions can now be safe a so d without patenting expense. If you have a pro ' n useful idea for either unpatented or patented, write today! useful idea for se.v.

Institute of American Inventors Dept. 3, 1926 Eve Street, Washington 6, D. C.



BROKEN OR USABLE

-all kinds even ingersolls. Highest prices paid for Jewelry rings, spectacles, slarm clocks, razors, cigarette lighters, gold

etc Cash may ed promptly awe'n, Holland Bidg., Dopt. PS. St. Louis L. Mo.

PATENT SEND FOR FREE BOOK --

Writing by Former Mumber Examining Corps (1922 74) & S Parant filling. CARL MILLER. Registered Patent Attorney Former Member Examining Corps U. 5 Patent Office

Panimorth Side, Bugt Mr.C., New York-Bond Blig., Dupt. Ub.C., Wunkington, O. C.

Do Not Delay!

Have you ever been startled by seeing a successful article on the market, and excessmed. "Why I invented THAT 5 years ago -I didn't think it was taluable enough to Patent

The Patent Laws were intended for the protection of the Inventor and the inventor who simplers on his rights may wake up to find someone else reaping the reward that could have been bis.

The Inventor with a valuable invention should set NOW Send this coupon TO DAY-to RANDOLPH & BEAVERS, 340-D Columbian Bldg., Washington, D. C.

ISONALIZED SERV

Registered Patent Attorneys Wathington, D. C.

Please send me full particulars on Patents, fees, etc., and "RECORD of INVENTION form"-Free

Marine.

WHICH OF THESE Opportunities INTERESTS You MOST?

 Today, choose the job you want—and prepare for it. Or if you are already engaged in the work you like best, start training now for quicker promotion. Acquire the knowledge that will help you to get ahead faster, make more money and have greater security.

American School, founded in 1897 as an educational institution not for profit, can

help you to reach your goal just as it has helped others during the past forty-eight years. Check the coupon at right, add your name and address and mail it at once. The school will send you details on its training plan and outline of study prepared by specialists. There is no charge, no obligation, so send the coupon immediately.

MAMERICAN SCHOOL

Dept. G646. Brazal at 55th Street, Chicago 37

CHECK, CLIP AND MAIL COUPON NOW!

AMERICAN SCHOOL, Dept. made, Brazel at 58th, Chicago \$7, 11i. il those ebitouries. Please send FREE and postpaid, bulletin and details of the Subjects checked.

- PLASTICS ENG'R
- Refrigeration Architecture
- and Building Practical Plumbias
- Automotive Engineering Aviation Drafting
- Aristion
 Business Manmout.
 Bishway Training
- Accounting and
- CPA

 Bookkeeping
 Private Secretary

 Diesel Engineering
 Surveying & Topographical Drafting
- beer Meral Partern Drafting | Better Forema Electrical Engla'ring.

 Electropics, Industr.

State.

- Drufting and Decign for Men and Women
- C Hadro
 C High School
 C Air Conditioning
 Mechanical Eng.
 Shop Management
 Tool Making
 - Better Foremanship Operations

.. Compation Apr. . .

Amazing New Invention

Address

Complete \$1.50

In manual form, # 1/x 17" Trouble-shaoting charts, Data on 346 radio tubes. 76 large job-sheets. 1.000 time-soving hints Covers all receivers-FM, etc. Developed by Beitman, noted engineer, teacher, and author. Order lodey without risk - use 10 days.

FOR BEGINNERS OR EXPERTS

Learn quickly to repair all cadlo sets. New revolutionary different comparison picture-method sumplifies to lio ser log No previous radio knowledge required. Introductory training included. Find any fault with case. Do expert radio work a most immediately liepair radios in monutes Instead of hours. Plan C B Copyrish ed. Take advantage of this new invention.

NO EOUIPMENT NEEDED

You can fix any radio naing a screw driver pilers, and a piece of wire-an-testers receded. Simple point to point picture suggestions (ell you where to look for defects how to test radio circuits and parts, and how to make the repair. You may try the plan for 19 days without any risk.

MEPAIR MADIOS IN MINUTES

NEW 1948

EDITION

Read the introductory job-sheets, fol-low the step by step p cture blue-prints, and fix any radio in a matter of minutes. Do radio work for fun-and profit. The complete simple fed training to yours for only \$1.50, postpoid. 10 days no risk trial.

MORE HELP - IF NEEDED

Supplement your study clear-up all hard problems, get about in Hadio, A companion 19 leason Practical Had o manual will give you added the substance being you get about 7 ster, wearnt important farts in greater will include the cover-means also in your trial order. See coupon, Address:

RADIO MADE EASY

Let this unique plan with its easy to tabilers and diagrams, s) uplified all ustrations hants, job sheets and practical exattribes teach you besse radio facts. Learn Important shortthat in radic frouble shots the Make needed tests without

testers, trace the signal, pressure voltage, within the hour after receiving the plan. Follow the comparison tests given on large trouble abnoring blueprints. Over 1 000 repair bints. Data on all tubes. Covers areay radio set - new and old.

10 DAYS "NO RISK TRIAL"

Examine and use Simplified Radio Servicing plan for 10 days in your own home. Apply this feetin que and repair one or more radios. Then decide to keep this greatest radio training barrells, or return the material and get your money refunded in full. You take no risk

No Risk TRIAL ORDER COUPON

SUPREME PUBLICATIONS. 1 S. XEDZIE AVE., CHICAGO 12, ILL. Ship the following manuals to me for 10 days' trial under your moneyback guarantes, 1 am enclosing \$ full price. Ship Postpaid.

Complete manual as described.

Described Radio Manual @ \$2.96,
Companies Volume. 19 leasens.

BE A WATCHMAKER

Enjoy Security and a Good Income in this Skilled Profession

There is a pariou-wide demand for skilled warehmakers! You can prepare for a successful career by training at American School of Watchmaking. In this respected field you enjoy clean, hght work in jewelry stores many watchmakers establish businesses of their own. Millions of timepieces require frequent service — there is always a need for skilled men to hundle



VETERANSI SERVICEMENI Courses assessmed for Veterore Training under G. L Bill.

these delicios instruments. American School of Watch-making offers a fully accredited course, taught by experienced watch makers, with all equipment necessary to learn every phase of this

profession. Now is the time to come to Los Angeles to prepare for a well-paid, permanent career as a watchmaker. Write for complete, illustrated booklet on this interesting field, and A.S.W training.

AMERICAN SCHOOL OF WATCHMAKING Division of American School of discents lastrumants

\$247 W. San Pernoado Rd., Los Angeles 20, Calif., Bopt. 5-9 _____

AMERICAN	SCHOOL	10	WATCHMAKING

\$547 W. San Formando St., Lee Angeles 34, Calif., Bapt. 5-9

Please send me your illustrated booklet and complete information on the accredited A.S.W. Course in Watchmaking.

Nome			Age
Address			
City		Zone State	
Check one -	☐ Veteron	☐ In Sproton	(O-6

ELECTRICIANS! RADIO MEN!



OVER 500 Large Size Electrical and Radio Shop Prints -Now to read and use them

H. C. LEWIS, Press, Dept. 49-86

Needed by war worters, insintenance men, beginners, old timeral Nothing else illin it. Saves time, helps boost your pay..., 4 GREAT BOOKS IN ONE! I. New Step-by-Step Trouble Shooting Course. J. 500 Shop Prints. 3. Elect-Radio Dictionary & Spare Time John.

FREE! 1 yr. Technical Counset by trouble-shooting problems.

SEND NO MONEY! See offer below. Sar startion guaranteed by famous COYNE "Learn by Doing" Elec-trical School, Rush coupon now!

FREE TRIAL

100 S. Pauline St., Chicago 12. M. COUPON
Send, with all shipping charges puld, year new OOVNE Bloomical and Radio Truchia Secution Margael Wathin 5 days ofter
mailthing it if it afthor rathern it or evend \$3, then \$3 monthly their total of \$8.95 is paid if I (limb print \$8.00-you neve even 105.
Same 5-day free trisi and return privilege.
ADDRESS

CONTRACTOR OF THE STATE

PALPHABETS

This is a imique collection of 124 complete siphabets—ancient, and modern. Many of the siphabets are rare and very difficult to locate. Never before have all of them been included in a single volume for quick reference. This rich compliation of the letterer's art offers real inspiration in specialized layout tasks A copy of siphabets Ancient and Modern belongs in the studio of every art director Price \$2.00 postpaid Money back if not satisfied. Limited edition. Please order promptly, Padeli Beak Co., Dept. Pt. 330 Broadway, New York 3, N. Y

BECOME AN EXPERT

Exacutive Associated and C. P. A. a care 52 000 to \$10,000 a year. Thousands of from most them. About 20,000 Cartefool Public Associated in the U.S. We train you thoroly at home in appretime for C.P. A. summinations of accounty accounting positions. Province structures unprecedent Personal training under supervision of staff of C.P. A. a. metading members of the American Institute of Accountance Write for from book. Accountance with Profession Test Para. LASALLE Extension University, 417 So. Dearborn St. A Correspondence institution Bept. 865-14 Chicago 8, Ill.

Get Ready for Big After War Opportunities!

Act now to get a better job with more pay and pleasant working conditions.

Oct into Drafting—the basic profession where all post war products will start.

I will train you at home—give you experience—doing the same kind of jobe you will do with the best paying firms I furnish instruments drawing table and all squipment when you start.

Write today for vital facts and FREE illustrated book. Once Are.

For year Dobe Doy 29 Libertyellia, I)



Wooderful, new device, puides your hand; corrects your writing in few days. Big improvement in three hours. No failures. Complete outline FREE. Write C. J. Omnest, 35 h St. Louis. Me

STUDY AT HOME With A Chartered Educational Institution Mrn with legs) training wis higher po-nitions, larger remines and not are higger secretary in business and public life. Op-portunition HOW greater than ever before. Complete source lucludes 20 college grade leathooks Send for Colarge McKiniey-Pagnavalt Incorporated, 4610-LB, Shoridan Stood, Chicago 40, Illinois,

Find out your ability, Send name, age, occupation and address for Free Vocational Art Test.

ART MISTERCTION, MC., 9145 Art Instruction 94g., Minneapolis, Minn. (Formerly Federal Schools, Inc.)

Thrilling Work COLORING PHOTOS Pascinettes vocation learned at house by those with aptitude, Thrilling pasting, Rochus method brings out He-like colors. Free booklet.

EASY TO LEADY THE E. Michigan, Dept. 1264, Chicago

A SIMPLIFIED ART ANATOMY OF THE HUMAN FIGURE by Charles Cartagon. The moots they're talking about! Doe of the most informative books of its kind for both student and professions artists Charle notes and over 350 drawings show detailed studies of every part of the body, posed and in action ONLY \$1 POSYPAID

HOUSE OF LITTLE BOOKS BOB & 11 St., New York 3

FREE			-
Bookle	INFORMA	and OTHER US	TENTS
900 F. ST.	E H. PURD	WASHINGTON 4	ATTORNEY D. C.
NAME			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
MARKESS			



Bio opportunities and jobs waiting for those who speak Spanish. Millions of dollars being invested in Mexico, Central and South America. Enjoy more-sura more. Inprease social, business, travel and reading pisasures. CORTINA Method famous for over 60 years, teaches you to speak like a native. Learn quickly, sasily at home "by flatening" to Cartinaphone records. Thousands have, why not you! No risk under our Five-Day Approval offer. FRENCH, GERMAN, ITALIAN Also

taught by this assesing method. Send for Free Book "The Cortina Short-Cut"-state language interested in

Dept. 129

CORTINA ACADEMY—Established in 1882 105 West 40th St., New York 18, N. T.



GET INTO CARTOONING!

Lours Carrieough big Future Dur rection course restains 11d state in 4 sections through you have to make late not autab a curcount' i ampirée murse inclusions peur a critic de Hartman Studios, 2436 W St., Lincoln 3, Nobe,

Giro Prop — Any Child Can Fly It

America's New Exciting All Metal Toy

Retails 5% oc. Sand \$1.00 for 2 samples with 2 blades each. Postpaid.

HERMAN M. KRUSE & ASSOCIATES

301 FOREST AVENUE . ST. LOUIS 19, MO.



waiting Get in on the ground floor by starting now if you are mechanically inclined—if you are handy with a piers and screwdriver you can quick y and easily prepare your-gell now for a big job, at big pay, in this big fast-growing multi-multon dollar industry. Train at home or in the shop least by doing Combine theory with actual shop pract a Take your place with the leasters in this big industry. Insure your post war future by acting now.

GET IN ON THE GROUND FLOOR

Modern refrigeration and uty minditioning are as simply up A B-C. Work on action, machines. But staff of report instructors get you off to a figure staff of report action for GI true sing. Tool owe it is yourself to investigate this wastend experimently Learn the facts. Judge them for yourself We to today. A postered will do



Coupon TOD

111
HOW/
יייטאן
LEARN
IN YOUR
SPARE
TIME
AT MORE

mercial Trades Institute, Dept. 209 W Jackson Blvd. Chicago S. 200 S. 20th St., Birmingham. Ala.

Without obligation, please send me the facts. Let me ludge for myself the opportunities and post was accuraty this training offers

Check here if interested to GI training

MANUE	-	B-	Ŧ	ı	•	*	7	•	+	٠	+	-	Ŧ	٠	,	-	-	-	-	4	-

CITY BTATE



"This is the way I want to live -the rest of my life!"



Mrs. Robinson, Jackle and I aren't sailing any land nor promoting anybody a products. We only want to te you how we've learned to have more fun, more living and more security than 98 y of this world's families has ever had

We call it our "Have More" Plan because that a how it works for us have more of just about everything that makes are worth Lying

Our Have More Plan is the true story of how we Robinsons moved from the city to our amail place in the nearby country to find a little land and a lot more living while I kept a regular full-time ob

It tells how we grow most of our family a food in spars time —have fun doing it—have better living—more supplies and fresh air—more peace and quiet—more security and independence—in fact, as I said before, more of just about everything!

All The Details

My "Have More" plan contains over 50 000 words 73 illustrations many actual photographs of our own place And I value the price as low as I could only \$1 00. It tells just how we do things—all our short-cuts, ideas, labor saving methods—how it takes us only an hour or so of riesh ages a wonderful garden del rious rabbit mest, rich mik butter cream from our miniature dairy tasty ham, pork baron, sausage gress turkeys equal, spring lamb honey bees fruit trees instead of shade trees luscious grapes rasp-berries strawberries etc -how we use the latest easiest preserving methods, including quick freezing (Note: no one famiy should start all these projects at once But we describe them all so you can take your pick)

No "Magic" About It

Now please don't get me wrong. This is no crack-pot theory' on how to make an easy living. I suppose that if you shedulely had to you don't also also lime entire, you'll a small place like our two acres. But that would be just existing not really living. You we got to have some ease income—from a ob or a pension or something. What I measing is that with my Have-More. Finn you can make a small cash income into the best and happiest kind of a lying any man could want. That a why we can't our Have More? Plan.

Furthermore you end your wife have to be real partners and ease, working together. If either of you think of the housework and the chores as just drudgery you better go live in a boardinghouse or a two room apartment. Personally, we wish we could spend more time working around our place—it a so interesting. ad lastest, or

Will You John Us?

A friend said the other day 'Ed. why do you bother with other people' Why doo t you set 'e down and just study just away int and your Have More Homes cast' Why try to aprend I all over the country' I may sound at y trying to tell you why This is my job now I am putting ful time not gathering information on country that a far ourse was and others. I feel as meabow that is the fear is come that to I againg to need at the help it ran get toward happ ness and peace and security. We seen't always suing to have a war boom going no. I we got a boy I want to are grow up to a good country and if ten he twenty my lon American families can get set as we'l so the hobitsoon family is I don't think stything can bust this not on. Do you see what I mean? That a why I we worked so hard putting this Flan ingether. That a why I was an exceeded to be hept the price as low as I possibly could on y \$1.00 postpaid.

Now It's Up To You

So if you are one of our hind of people if you want to have a look at our "leave More ? An just fill in the coupon here and send it to me when you get the Plan by return mad look it over if you are dis appointed in it in any way or if if doesn't suit you put it right back in the package and ceturn it to me I it give you your dollar back and send you a dime for your hot, age.

On the other hand if you like it and I am sure you will help me by abouting it to your friends and setting them to stand at These More.

Setting them to start a "Have More" Homestead also Tiurn for a "little land and a let YOULSON. HOROTON 2506, CONN.



of Herring

Send to ED BORINSON.

P.O. Box 2006, Naroton, Conn.

Deaz Ed Here a your delier I want to see your "Mave More".
Plan If it a what I want I'll keep it. If not I'll seend it hack and you is to return my money and we'll still be friends.

Name .									+	4 +	,	
l diffrant		+								-		
CHT	r Planes	make	checks	B1.05	bo	COTET	Marik bank	te chara	:37	- 4		



FOR COUGHS FROM COLDS,

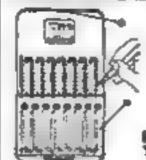
cuts, aches, hurns, sprains use TAYLOR'S DIL (Called Taylor's Oil of Life over EO years). At your feverite sters. 35t, 75t, \$1.50 G. C. Taylor Co., Inc., Fairport, N. Y.

> When Writing Advertisers Please Mention Popular Science Monthly

Many a former clerk, soldier, housewife, mechanic, teacher is now writing for profit. Why not you? You can learn and start making money right in your home . . . under the unique, practical methods of Palmer training . . for writing fiction, newspaper features, magazine articles, radio scripts. Palmer Rupert Hughes. Katherine Newlin Burt said, "I d have started ten years sooner but there was no Palmer Instarted ten years sooner Ruth Comfort Metchell said, "You are makstitute then ing it possible for beginners to travel over a highway, instead of a rough road. You are proving ours is a profession calling for such sound, sane, constructive training as you offer Hundreds of successful graduates. To find out if you have writing ability, send for our 'Talent Finder Return it for our frank, confidential analysis and advice. No cost or obligation. It may start you on an ideal career.

PALMER INSTITUTE OF AUTHORSHIP

5362 Hollywood Bird., Hollywood 28, Calif. Dept. TM95



Sturdy steel construction for lifetime use. Adds, subtracts, aids multiplies lon Capacity 980. A real marbine guaran eed 5 years, Thursands of satisfied uners Hend name and a tires. We ship immediately. On delivery, important \$2.50 (plus (O D and pastage charges) If you send \$2.50 with the charges of the charge Free \$250 chargest if you send a Leather-ette rase 35c gass lung). Your money back after 10 days' triel

tf not skillebed TAVELLA BALES CO., 21-MA West Scendway, New York 7, N. Y.

EFUSE TO GROW

"GIVE YOUR HARR A CHANCE" is the assering book by J. W. KING. Sc. St. on deadroff buildness, thinning and gray me hair Much usuble information. Ohio State Medical Journa Best investment to Science Advention Debupks Seventific American Beientific fact, - Susset

half finds Severage American beleasing incl.—Severage Manageme Without commercial bins.—Tenching Brategori First of a sciential Home Acres, Experiment analytable First and Several Record Practical. Survice News Letter tend only \$2.00 teday for postpoid copy of this particular instruction, on how to also your links. 5th printing. Prompt cofund if not belond.

für feun Rain Attende of malloca for the

BRADNER PUBLISHING CO. (Est. 1833) Dopt. 32, Cambridge 42, Mass.

*pecial WHITTLER'S

to apported only white pine bights ready to white to the founded products. Also for uded as X ACTO MUNELLING KNIFF will complete instructions. EASY FUNE Complete his semi-property for \$1.50. Write new to Bool. PS. 1402 Charles St., did Whittler, Lu Grossa. Wiscausia



Complete Course

Bely \$15.00

BASY...PLIASANT WORKI

Let CHAS. H. KUHN, with 25 years actual experience in drawing a daily newspaper cartaon, touch you have to create, draw and sell your work, 32 complete lessons—one sent each week. Frefessional criticism on every lessen. Write today.

KUHN SCHOOL OF CARTOONING Dept. S. INDIANAPOLIS 4, INDIANA 420 MURPHY BUILDING

Don't go on day after day suffering the fortures of a clumsy trace that present on your hips and back, gouches your flesh slips and slides and leaves your rupture DANGEROUSLY UNPROTECTED.

that the truth about rupture care and how the newly parented Vata Properture Nature Ade (118, Reg.) appliance with its un up fea unes can nelp your rupture, thought disappear. Write at once for FREE booklet confaining much valuable information. PREBULATIC APPLIANCE, 103 PARK AVE., N. Y. 17, N. Y., DEPT, 728

PRACTICAL BOOKS TO HELP YOU EARN MORE



REFRIGERATION SERVICE MANUAL

This new book covers refrigeras on press eme in Covers peras one for in the field and in the shop locludes but his disnessic and considerated types such as used in markets in a depart, soda four to ne as well as in many others 300 pp. \$2.00 others 300 138 blust

MONEY BACK GUARANTEE



PRACTICAL ELECTRICITY AND HOUSE WIRING

Dischases common electrical devices principles of circuits wires and insulation grounding fuses and circuits witted methods planning installations installing switches fatures etc. wiring houses all a they are built alterations and additions wiring farm buildings bottoe certains etc. 200 pp , \$1.50



SEND TODAY



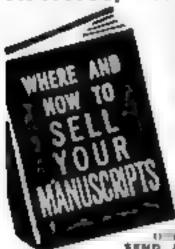
CYCLOPEDIA OF PAINTING AND DECORATING

Covers methods, tools and materials for the home and workshop, inind hig every branch of pa nine and decreating Any partirular job is to by explained with 12-tunirations to clarify the 228 illust \$3.00

RATEWAY BOOK COMPANY, Dept. 78-9 32 M. State—Chicago 3, 1)1.

GOOD MONEY // for

How to turn Your Stories, Poems, Articles, Plays, etc., INTO CASH!



Here, at last, is a volume that gives you like shocieuts used by professional writers to win fame and fortune? Streamlined guidance that haves you time trouble and heartache. Where and How to Sell Your Manuscripts Lis down to-earth writer a guidal complete in every essential detail. Covers Magazinges. Newspapers, Radio, Movies, Plays., Books. Comes.

Pincs. Newspapers.

Product Com co

##IEF LIST OF CONTENTS: What to
write and where to appl it—What the
ed. lars want. How to prepare manucollins want. How to prepare manu-

trebase of estions publishers agencies, producers at kinds of magazines etc.

—Plus What kinds of storage to send to each one Practical Writing tips.

Dictionary of color words (Stang idlams etc.)—Row to choose selling idlams etc. —Row to choose selling idlams money back guarantee. Get your copy today Write at once to

CAMBRIDGE HOUSE, Dept. 89 165 West 25th Street, New York 1, N. Y.



It's so supportant o waits a good hand for business and sectar supercenters. From Linguista permananto atten causes costiy errors and marks you for fallter. Why write a poor and? It as a easy to learn at home in operation.
While for our new free booklet holey. If you wish send life for a persental
publishe for shaded writing and your name bequiffully written.
In fluctures.
THE TAMBLES CONOCL OF PERMANASSES
N 430 8 dec 8 de Rancos C-ty we U & 4



BINGH 1986

\$15 Sealand Bell Guidang, Change 4, Misses

MASTER MACHINIST, MECHANICAL DRAFTING, TOOL ENGINEERING

Learn by doing in completely equipped modern shops Approved for G. I training, Days Evenings and Part Time Men and Women.

ALLIED SCHOOL OF MECHANICAL TRADES
1333 South Michigan Avanue. Chicago 5 Ultrois

Success in Music!

" THE ONLY HOME STUDY MUSIC CONSERVATORY OFFERING ; ALL COURSES LEADING TO DEGREE, BACHELOR OF MUSIC

Personalized Instruction for Professionals, Advanced

Students and Beginners by Eminent Music Teachers. Check courses which interest you and mail coupon for catalog and illustrated lessons.

UNIVERSITY EXTENSION CONSERVATORY

768 Ochwood Sivel., Suite U245, Chicago 16, III.

@ Plane	D Viella	[] Cornel	() Truste	et Bleve	bene [] Clarinel
() Quiter	☐ Mande	NIA BYA	den ti Kar	Training a	ed Sight Singrap
@ Cheral	Candacti	no 🔞 Pul	hito School	Maple 0	History of Munic
□ Herme	ny D Ads	anced Car	Remaition .	□ Arranging	1
Kame ,					

Numer	* * *	7 1	*	+	-	٠		•	•	*		-	ė	*	-		•	 •	•	-	٠	-		٠				-	-	-			4	-	•
Street											ŀ	+	4	. +		ŀ				٠.						+	h	-	+	4 4		۰ =		+	
City &	State				+ +		+	+	+ 1				4	 					_	+		+	4	+	+			+	+		. 1				4

Music expedence



M. C. Lowis, Pres., COYNE ELECTRICAL SCHOOL, Dept.	65-R7
800 S. PAULINA ST., CHICAGO 12, ILLINOIS	

Please send me a copy of "150 Coyne Electrical & Radio Shop Prints and How to Read Them." I may return this book to you say time within I days and owe you nothing. If I keep it I will result \$1

within 7 days and the book is mine	
MAME	
ADDRESS	
TOWN	TATE
If you want book sent C O D you have chark bore — eams satisfaction	pay pastman \$1 00 plus armil C.O D., or money back agreement



SURPLUS BARGAINS

SENSATIONAL VALUES FOR QUICK LIQUIDATION

SERVICEMENS GI BELTS



Of heavy cantan webbing, Adfuntable in size with snapos buchle, Evelete. beed, but gueranteed.

EACH. 980

ARMY MESS KITS



a ruletion Army mess kits. Ideal for campers, hoy scouts. used but guar-nateed perfect.

MEN 69c

U. S. GOV'T CANTEENS



Regular U. S. Gov't leave canteens, Plastic screw top cap chained to body Slightly used.

A117-METAL BODY 69c ALIS-PLASTIC BODY 69C Excb Each A119-Canteen covers,

A120-Capteen cups, ea. 25c

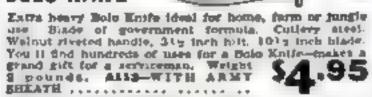
BANDOLEERS



Army Bando-Array Sendo-leurs of heavy khaki Geed Rhabl Good by bunters. Day senuts.

but guaranteed serviceable. A129-11 POCKET EA.

U. S. GOVT BOLO KNIFE



A212-LEATHER SHEATH, EXTRA...... \$1.50

USED U.S. GOY'T PUP TENTS



EACH... \$4.95

A101-Ropes, woodon poles and stakes for above. Per set . \$1.00

7 LB. RADIO PARTS ASSORTMENT



A "gold mine" for the radio eerv.cemen Hundreds of va. unblo radio parts including rivets so dering luge, sockcotis, reeta. Bistors ming condens-ors etc ALBOR-7 LBS.

CATHODE RAY TUBES



For experimenters in radar electronics etc. Sughily used by Gov't for test work. Gustantered perfect. Each tube (cated before an immen). These tubes are standard Nos. 58Pl or 5 RP4 with 5 Inch acreen. Specify number wanted when ordering List of other. 5801 or 5 RP4 tubes on request EACH.

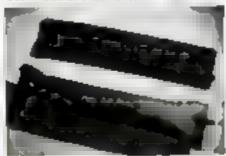
LENS and PRISM ASSORT.



27 LENSES, ALL NEW, PERFECT For experimental work to optics tunants of 27 precision ground and purshed primary and lens elements in essetted districters and focal template his variety post avec negatives, etc. Actual value over 100 to. Anto-

COMB. AIR PILLOW and LIFE BELT

Every audocramen hiter, camper boy scoul-



proof that!
10 1 4 0
thehea when
deftaled.
3w mmere hontomen 4 5 9 them as a life belt Quickly in-flated or de-dated Used but perfect MACH 98c

TANK CORPS RADIO HEADPHONES

Emrymely sea-4000 ohbu re-distance Brand new and fully functionated. With moisture proof rord and phone plug A splendid value for the radio experimenter

AIDS-PAIR \$2.95



50 LENSES, SEMI-FINISHED

Lenges simil ar to shure but not pul shed. At are branked and formed ready for pol-Crawn and Flittl glass. Worth many nes that low process 20.50 2.P.N.E.S. ONLY \$1.95 AS30.50 LINNES ONLY



SHIPS BELLS

Porchased from U S. Martima Cames. Measures 10 inches bigh, sed inch fare. Hig 6 inch ciapper Weight 15 line. Fine for farms clubs, estates, etc. A-841, ONLT \$9.85



BLITZ CAN

Standard pwv't, blits came. Used and scaffed but quaranteed leah proof. Mensured 16-9 to 18-7 Capacity 1 gal. A colerate bergula. A-542 EACH ONLY. 850

HEAD NETS

Real protection from in-sects, etc. Fits over hat. Draw string in onch. Cel. ports, etc. Fits over het. Draw string in ooch. Cell luiold window. For casss-



RUBBER CUP

WITH LID

Maken fine tobac-to bumidor etc. Al. guarenteet A 303 EA 590

ORDER DIRECT FROM THIS AD

U S. traties Goggleth stone eh h Creed elastic for industrial users, mail yes Blightly used but guaranteed ve

\$5.95 No. ALSO-

PLASTICS

LUCITE AND PLEXIGLASS In sheet form, Good workship sizes.

Transparent For custome lawelry, etc Easy to work and \$4.75

ASST. \$4.75

CATALAN—ASST. COLORS

Entruded shapes, rounds, half rounds, etc. Easy to machine Purphished in assorted colors shapes and lengths.

A.ET. 5 LB. 4.75

Ashermen, ele DNLT

Values ratore! Hundreds of hard-to-find Hems for home, show and cutdoors. Make remittances by money-order, back draft or personal check. Send 25% deposit on C.O.D. orders. No C.O.D. s on orders for less than \$5.00. harded sufficient postage on perce post orders—any overage will be promptly refunded. All quotations F.O.B. Chicago. Used Items and materials are guaranteed serviceable and as described. Your money back if not more than satisfied.

BIG ILLUSTRATED CATALOG FREE

509 So. State 5t. CHICAGO 5, ILL.

U. S. AVIA.

GOGGLES

450.

CAVALRY SPURS



Genuine Wishhons Nickeled brans. A102, Pair A103, Spur st per set of four 50c

MOSQUITO TENTS



Of marquisette with taped seams, Metal rods and bars tholuded. Covers cot probammock Brand new \$2.95

MILITARY SLIDE RULE



Specially designed for Army use. Measures 2 x 18 x % inches Callyards and meters. Reverslite aliding segments, Orig. value \$20.00, A121-EACH ONLY

Classified Ads only 50c per word per insertion, payable in advance. Minimum ad 10 words. White Space \$3.00 per line. To be included in October issue, copy should be in our office by September 1st, October issue on sale October 1st.

POPULAR SCIENCE MONTHLY-351 FOURTH AVE.-NEW YORK CITY 10

ADVERTISING

ADVENTIBING Placed everywhere inwest rates Remails guidance on publications, expert massistance on ade without charge. Newspaper, magazine, maning hat retebook free Chicago Advertising Agency 26-MF West Jackson, Chicago 4

PRINTERS artists, draftames, navous, make your own engravings at home \$6.65 Simple? Carson Institute, Plainview at Schookraft, 23 Detroit

ADVERTIBE 34 words 100 messpapers, 56 50 Lasts Free Advertising Surson, 46.5-F Cottage Grove, Chicago 15

BURINESS letters complete sealing compages Sa utying reports. Netherla. Notten sanding N Y

REPUT T Producing Advertising Low Cost Lonne's Agency Rim 623, 1326 Chest-But Bt. Ph. lade-pitis T Pa.

24 WORDS in 56 Warklins 56 58. J Darmell. 730 Hays, Jackson Texas

W ADVICE

DRUNKENHEAR Is a disease which respected to itentment Medical ship plus bullian sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet P S. Melson, The Messey Institute. Dwight, III

CONQUER where discouragement Oct. new Life grip with fraundly confidential being Sound, amount different Delais free Wr v Personal Service, Box 174, Pomoka Aberta 4, ada

AGENTS WANTED

AMBITIOUS School Seniors—We want Y O. U to sed classmating the Tope in Oreduntion. Harms Cards Highest constitutions Only Firm going From Boungary Chest and Card Case! Your saids that se! Catalogs going the winthing! Hursy Catalogs going the Winthing Hursy Catalogs and Minthing Mint

ETART Tour Own Business on our captta. Always your own boss Rindreds
average \$6 000 to \$17 000 an and save yest
after year. We supply stocks equipment
on cred I 200 herse necessities. Se ing
emperience unincreasary to given
ful opportunity to own pleasant groß abie
business backed by world wide Indus ry
Write Rawleigh On Dept. I-U-PEC
Prosport In

MEN Women Make More Money Cash In. On Ha socially Advertised Photo Stamps. Real giology photos in an artist stamp side ministure, 100 for \$2 Made from any sole mapshot photo or negative O real your own full of part I me business to the out investment. Repeat orders make standy income Write for Pres samples and information. Photo Specially Co. Dept. 2 0 M. W. 13rd H. New York I.

UP to 100 per cent profit arting friends. Chris mas card assortions a and Personal Arabonery Religious, Gift Wrapping Birthday assortments like up Request 21 card 6, 00 Christmas but no approval Prec 26 for 61 00 Personal Christmas rand and Stationery Portfolios Special Offer Elemina Greating Card Co. 16 00 Elmina. K. Y.

BILVER Plating Liquid Eimply Rab On with a cloth Chans Bilverplates, Polishes due rubbing Pula en genatue 1003 Pine aliverplate Remets sliverplated ware like new Suverplates on to brant exper bronze etc Lasting finish won tooms off Bases representative wanted Dentals free Haprocass Products Dept 164 Aurora Li

AT last? Something new and sensational in Christmas cards Amazing Obette Cards I ke costly oil pain into Designs never before offered Dets orders fast Beautiful 25 for \$1 Cards name improved 12 other asso, with Big profits Samples on Approval Pai Co 3043 Locust, Dept 340. St. Louis, Mo.

CHRISTMAS Carde Beautiful 21 and an attiment conta 50c in quantity. Seda 8 00 Write for sample on approval Large territy including new. Of the majorithms is Carner and Iron white scenes. Everyday assortments and Sta sonery. Presentables of 25 for \$ 40 persons, the Einstein 1830 S. Western Ave. Chicago 36

CHRISTMAS Cords Earn big money Take orders galory from friends 25 saquiate featers with name \$1.25 brew Sacring 19 designs America's featers seing 21 Christmas folder how Costs 50c Seas \$1.00 Request samples today Sunshine Art. Dept. P. 1.5 Falling St. Hew York City

61 STARTS you in business, Sell Deliuze
five fold thes 100 woo, inter hing
Chais you only 87 per dozen you make \$5
dozen Send \$1.00 for special a trodictory
wifer I've five fold thes Caralog complete
cru Pros. Phi ps Neckwear 20 West
32nd \$4. Dopt \$2.30 New York 18

MAGIC Ratio At touch of lighted signrette at horses are Off Waith them. Bur 35 Races in mailing carrier \$1.00 Admits Commission, 40, in scien lots Order direc from this ad, or send the for entiple sevelope in races, and cramplete detern Place. But 12 Flushing 28 New York

EELL Christmas Cards Make easy money showing progeous Chris nas De Linag Retigious, B. hday a mor men's Brat onser's Over 100 qu. h severs Special Offer Write today for \$1 Cris nize but assortation on approval Hedel hamp & Ou. 342 Broadway Dept. Phys. New York 13

Ci EAR VU for your windshield specialists. M fors Here & a give thing accent for safety. It creates a lovely sparkle to any times and gives safe them; second in for must full snow of steam Age: a said 50e for sample and introductory order Clear-Val. 3024-30th St., San Diego 4, Calif.

OODD Paying Business Silvering Mirrors, plating autoparts reflectors, bicycles, bathroom Silveres etc. by into method He tanks or thop required, suifit furnished. Pres Bookut Commetal Co. Ave O. Denster limits

CALL On Priends W h Sensational Personal Children as Carda-25 for \$1.00 up. Associated to unfording than 15-cent \$1 eard \$1.00 Associated, Profit 50c. Semipast on approval Wallace Brown, 228 Pt th Ave. Dept \$ 6 New York 10, N.Y.

MAKE more money State Christmas mit solve early State now Neins furnal of Opportunities withouted I (berg) commusations Rush request today for Free whose sale ranger McGregor Magazine Agency Dept PS 5 Mount Morris II.

BCHOOL Seniors Rel; classmates America a most beau its distinctive Oradustion Name Cards Post rely highest commission Largest series con Lowest prices From Cards and asterile hit Printcraft. 1423 & Eim St. Octanion 5 Pa.

PLAYER wine puck of cigarettes for he New coln opera ed automa is parout machine note 8 00 profit per puck List price 345 50. Send for agent deat Webb Distribution Co., \$12 M. Michigan Ave., Nept Pt Chicago 14 121

EXCELLENT Eldeline for Pythting Salesmen Decaleonamia Name Pastes in small quantities. Also make morey applying in all on Automobius, Pres Samples. Raice X-104, Scaton (18) Mass

210 profits taking subscriptions for all magnitude Agents Confidencia. Catalog listing over 2000 periodicals and complete warting supplies Free Pines Subscription Agency Flushing New York

MACHE Recom-At rigarate touch als historica are off Past seller Big profits to There brings samples wholesale prices. Barkley Co. Dryden 5.

WHO: ESALE Raser Blades, Laces, Excelin Textde Hilvertex and others Wr to for a sand information National Sales Company Dept 314 1319 Stone Street, Fluxt 6 Mach MOYAL Cive in the dark title track: New line cay to see money makers. Sure repeal saint. Write today for free details. Royal grow Products. Sales Dept. P. 1673 Broadway New York 18, M. T

START big money business on few dollars.

New successful cleans guerrice Big demand energwhere Easy, quick income
Wille Americano, 211 H, Seventh, St.
Louis Missouri

EVERYDAY Carda Make \$4.00 with every len \$.00 Fl tox assortments you sell Also 25 for \$1.00 impract on de W its for samples today Moward P Elin, Dept Pft. Fl man N 2

SELL, his demand Hema-Bress Pressing frembs Counsel in Hair Goods amongst Coursed people New field Wite for delaus O M Hair Co 136 Kings Mighway Brooklin 23 New York

START YOUR own business! Double your estrongs selling fleshy Contume Jewelry thorong like wildfire Write for Pres sample Murry! Spottight Jewelry Su to 2018 25 Hurtington Busing

LICK After our involls. Start own huntness home after Boutset describing "Co.section of 121 I sated Plans from Easter On 2144 Grand St. New York

100 CIGARETTE Rollers, 830 00, Dolle, descript 212 00; Penella gross \$1 95; Aspirin, gross boxes, \$1 90 Bend payment Catalogo free. Mills Bales, 901 Broadway, New York 3

PREE Water and our concentrates makes flavors, jotions, shampoos. 72 products labels bottom furnished. Qualos P. 20036 Russell, Detroit.

SELL Petra Picture Notes " Something ready d Parent in greeting cards Sample free Dunbar Cards. New Brunswick 21, N. J.

EX-O-LENE! Powerful Mile Stretcher Extremely profitable. Guaranteed Product Distributors wasted Thermopower, Peorla 4 II.

BO it with Butter Placer" makes Margarine and Pastry taste better. Write tend for free particulars Sample 25e M B Makes of Rome & Y

200 MONEY Making Ideas Plans Rare forms as Schemes Expensed servets Particulars Pres. Portnice Co., Box 512, Day-

PR'7E parkage displays. Jokes, tricks profises on display cards. State your line of business Engis Specially Co., Akron 11. Ohio

MANITY Stair Trimmer Sells like wid.
Trims as you comb. Saves barber by le.
Samples cent on trial Eristee, 143, Airon.
Oblo

26 WAYS to make money with Luminous Pan (Shines in Calls R shines for gran able details Ward, 973), Sayleenk, Com

SELL, Auto Body Radietor and Solder be Trade New Flux Saves Time Big Profits, Write Today Crone On Parkland 3, Washington

BIG Money selling Negro calendars and novelties. Commercial Ad. Inc., 464 W 153 St., New York 31, N. Y

33 PIRE Extinguisher sein wholesale or direct Pire Killer FT Prankita Syracuse New York

PROSPECTS Every car owner Sells for \$1.50 costs rou Mr. Quarter brings namper prices Barbay Co. Dender 32 Vo.

OOLD Locquered Window Sign Letters Braut.Fa La et Signs Penns park From Samp et Alias 7941 Haisted Chicago

300" PROFIT Selling Pep And Energy Min I n Guaranteed, best seller Atme Pharmaca, Fairfield Asabatta

4 AMERICAN POLICE, JU JITSU

DEPEAT A Boxer Secret Ju-Jitsu Defense.
Complete instructions 25c. Dr Malcolm Smith. 1104 Union Ave., Montreal 3, Canada.

6 ANTIQUES, RELICS, INDIAN GOODS

Jet ANTIQUE Pirearms 6 000 Bergains.
On us. 1 S.an Re s.a. M nerma Caztridges. R See Filt tours Press. S Beerda
Ca away w. h Photos sale 25c Heals, Wes-

aworlis cape a daggers pariou armor as at ated ra alog 35; Raturs Abeas, \$60% Lexington ave N T

ANTIQUE firearms, awords, deagers, Lists free Nagy, K.-S South 18th, Philadelphia

RR ARCH SUPPORTS

PEET Hurt. Plastic Arch Supports made to order, Unbelievable Comfort, Imprestion Materia. Fire Airherati Co. 600 W. 164 St. New York C v 32 N Y

ARCH Supports Send \$1.00 and Shoe Site. Money Back Quarantee. Blairs Co., 4530 Sheridan, Chicago 40

BIC Profits Manufacture Custom Arch Supports, Julie Corssen, 2638 Geyer, St. Louis 4 Mr.

A Cure for Fallen Arches. 35c in Coin Laws, 1332 Laketon Rd Wilkinsburg. 11. Penns.

AUTHORS BERVICE

NEW writers needed to re-write ideas in newspapers, magazines, and mosts appended opportunity to break into feact na g writing field May bring from up to \$5.00 per hour spare time, Experience imperessary. Write today for Pree details No -pagation Postcard will do Comfort Weiter a Setaice 2:0-R South Sevenia St. 2 St. Lines, Mo.

TRUE Life Stories Wanted For Publication remarks and are adverte our Any length Bend promp vio U B Literary Agency 136 Liberty N Y 5

Mr: ppt | Wr r rg tha ruellona 50r Manuscr pt revision traing Underbit. Beebe, A Raises

ALTOMORIE Es

MOTOR Brade Privat and Boost Was de famous reries automobiles motorcarios il, actraired, dear bed Erm no information, came, raises automobiles motormation, came, raises automobiles motormation etc. Foreign drivers, care shown Orand Prin race plormation 32 to Ah Jesu na new racing book describes Morenous Mercor world a records Booker ribes formation Mercor world a records Booker racing Photo A hum Action photographs in mous ruring drivers care \$1 bo formation famous ruring drivers care \$1 bo formations formation book of foreign raises, his experiences \$2 to Motor History of America world a wonder brok automobile heater sees \$2 to Motor History of America world a wonder brok automobile has been seen \$2 to have a most romplets ears \$3 to. All postpaid anywhere U.S. or average America a most romplets on Ellis

CITMEN S Motor Scraphook A "must be sent Time Magains Is untratum. describes hundreds early gass he steam sies sie a stument on motors ses Includes experiences and fast on it g amust are a traby the such a Fast of Citmes one time word a visings a formed to dealer Editors one at a word in the St. 30 meth different field up as a be \$5.30 meth different field up as a be \$5.30 meth different field up as a be desire edition \$2.50 meth different field up as a be desired as a complete cutation Motor Books for Citmer, \$135 W Fice, Lee A. sees & Ca.

ARE Steam Automobiles coming back! Many think go! Book "Modern Steam Car 160 pages, 100 illustrations. Doble. We be Stanley, others. Specifications, photography carry and latest a compet Tells how operate steamers Data by lett. ongress being a Pow paid \$2 00 Delune on h bound ed no \$3.00 formed 25 for folder in he by hisher wirls steamers. Photos, racers in even int odurational ancient steamer information. Clymer, 2125 W. Pico, Los Angeles S. Calif.

MOTOR History of America. World's wender book automotive history 416 pages with supplement by Floyd Clymer 150 illustrations. All early automobiles. List over 1500 one-1 me automobile man; facturers in America. Fig. pa.d. \$1.00 flequies cloth bound \$4.00 Clymer, 2125 W. Pico, Los Angeles 5, Calif

UNIVERSITIES and Oil Corporation tests give Writigas Turberator \$3 increases mover makes and power Users report gase the eran my exceeding 60. Wrench are and 15 in tures. One auto make year John Hamley 5718 Loraine. Dr.rott 8. Mach.

AUTOMOBILE Bacing Book. Pifth Edition—Revised. Tells how to build distribute bodies frames, engines. Records superchargers rules formula place more on versions, readster racing las Pords \$1.00 pcs'paid \$1.15 COD Ray Karls Department 376, Madagorylie, Checkmatt. Ohio.

MOTOR Books Most complete automotrie instact; by selection in America Enterica, technical racing Send time for book catagor Clymer 2125 W Picu, that America 6 calif.

AUTOMOBILE Racing Photo Album 113 eliciting the ograpes record cars drivers. Stables Famous tracks clustrated Poston 4 51 50 C ymer, 2125 W Pics. Les Angres 6, Calai

DON T Go Wreng on med cars 30 Conune tipe Tens that pover (a), \$1 00 Same actory or Money refunded. Tony Corak, 100 Semal Ave., Carfield, New Jersey

CURTOMIZE your gutomobile falustrated her recoing ideas their actions specific model runges by simple methods 63 Speedsheet Noz. 23-C Atradia, Cantornia.

OARAGE doors, all types, controlled from Dashboard, Complete "Build Yourself" Plans \$100, refundable, Pres Particulars, Kaylor Laboratories, Lynwood, California.

1945 IGNITION Supercharger Pep. Mileeast, Past Starting, \$4 66, BC Mfg. Co. 255 E 149th St. N. T.

STEAMAL TO Digines Butlery Dautpown! Was of Steinas, RFD & North Bruns-wick N J

S AUTO SUPPLIES A EQUIPMENT

AMAZING new Mote-Vator injects waterreportants mester just like newest fighter
planes. Bur is 13%, water sares 20% to
30 gas P events Carbon Increases grower' El minutes rarbon and take jobs. Not
a gadget fermat obs) performance beens
motor the new Wooderful pin mar punitbit ties Wo inverment. One low price
instantes increase a minutal! Meste Ve or in
your fermity flend the for banklet giving
complete setuils Dept B SX Labora ories
P.O. Bur Ji. Middle Village Long latend
Mgtr York

WATER intert on far your car. Whe confine the speciarular benefits to militare attreat when arrange can make installation at very cw sust with minimum took at parts evaluable to rathers. No castings increase power mileage, up to 10%. Decrease carbon angine wear. Developed and proven by our engineers, we now offer complete plane in the one, only \$2.00 rath check or money order Mughes fingingering Laboratory, 1630 Jefferson. Evaluation 12 Indiana

NON RATIONED amakingly powerful outper gollon. Get handbook with complete combaction to impossible yet to part that it has never been as acceded to the book pangle have goldoned from a that Oak tarke a never heeded, are tage U.S. price 12 cents per gollon. Get handbook with complete information, list of necessary equipment sketches, etc. Send only one dollar to Alberta line 192. A handbook Cabi

R AND R Mig Co., Box 546. Marine Division Ambreson I dia a Speed and Power Fourmert History essent estader Leads D at in ske Manife de Camahaite Pach La de Phabberly for Vergar and Model A Poeds Alt Pamps Clauses Tachom serv Autop best Spects I terature 51 08

CONTEST tour auto fractor or Marine elegine to hura diesel or store oil. Protes factors method Different and better Costs nothing to investigate. Write for free corupt No. 3. Marringion Co. 222-224.8. W. Stark St. Portland 4. Oregon.

ALJO Part Burners Uses Chesp Fuel. We er Injectum Del sig double carbupour system Castings for all morors. Insia is or Agents wanted Original Mahalact ever pince 1935. Houston & Logan. 2-12 Addison Berkeley & Land. HAVING Car Trouble? New, Used, guaranteed auto, truck parts cave money. Transmission specialists. Describe needs: Immediate reply Victory, 3619-1/2 Guanteen, Chicago 35

EPE TAL Big 15 th, how of over 3 006 popular size essentiment of steel boits, buts, strews, washers, cotter pins, hose clamps, etc. 50 00 pcs hard Melts A strait Mard ware Dept. New Brunswick, N. J.

UNLOUNCE IN Patent Penging Device.

Busins ced to open Push Busion Asia
Loras icaiantly also many other calls

12 to per in t w h is a ructiona. Un
locaces B low Waste Plains N Y

MORE M les and Power or Money Back Send \$2.00 Treat 40 gallone Gasoline But a pris Hyertishe, Box 46 Long Island City N Y

Oit- Pumping Motors—Brought Back to Normal without Ring Job. Write for Particulars. Jee Mulmer, Box 3163, L. St Pau Mign

PLUCERNCENT Driving Lights for any car or t sek S sep rate inavisations \$3.00 Superior Tool, Bus 1836-x Anderson Indiana

PRINKRYE rour tires with plastic and Puncture proof your tires. Details for stamp Bette Bux 600 Borget I range

DIVERSION Uses become to run motors Circular on plaza Rush same. Houston Maupin Tipo City 37 Onto

ANT! PREEZE Moncorrentre Inexpensive Manufer are per self De's le for slamp Selde, Box 600, Borger Texas.

1945 IGNITION Supercharger 54 00 Pep-Milence Past Starting Ed Mig Cu 3509 Brench St. N Y

TIRES Orad 3 6 00-16 66 85 Pastonger 7 re Re Nevs 83 50 Discount to Dealers, Alled Rubber Co. E. St. Louis 11;

OASLESS One quick y Beally Compound Formula loc Didy O 4., covangous, Kr.

Hore every feature mu want. Plans for Mouse, Sport Comp and U thly trailers. On sing describing 9 models for 115c th Canada and everyment Jim Dandy, But 125 B. Wausey, Wise opaca.

ASIATION

WAR BARGAIN Airpining now graticals send for for Directory of hundreds of air, and and gidder bure socied all over the United States some probably first this, with owner a price partie and address 135c by first rises that I live Ed ton J at out. Used Aircraft Directory Athens Drie

28 SUPERPORTHERS packet route name 30 person place in a packet name a Booting B 28 s also packets Nava Averatt A my Atternit B 12 Packet Sec 3 amounts for 8, postpaid Limits 14:1 NP Nor haves 12th Ok anoma City 8, Oklahoma

LUNCOMME 645 Cub 6360 New cutator 25c tasts the sunds of sense lens, but gains in airpiaces flotters parts parachites aupplies Aviation Bistness Opinic Units section terrided free National Bex 1662 Cu Toledo Octos

PROPELLERS High grade att types stars Art ser 3 blade for arcta bra s Para delatery Lara free Air co mo or disgram for Standard Aerocast Pi Worth Treas

PRLOTS And Mechanics. Complete Himtrated Alternater Handbook Included the, installation, pervising, setting feets a charte etc., Mc Lee Stenne) Because Nebr

TAYLORCHAPIN Fairch ids & Mar s
Other Used Aeroplanes Said Direct For
Lowest Prices, Send 20c for Latest to
mgs, Advanced Aircraft Service P O Box
3197 Savannah, Georgia.

JET Propulsion Experiments New Principle to drive bouts, barbaile model help copiers Circular on Disting Start hame H suston Maupen Tipp Ci v 84 Ohio

Cupenistental Rocket. Jet Motors Oulde for model builders. Send for circular on plant. Marwood Co., 1996 E. 45th. Sent (le 3. Wash.

PREPARRICATED Metal Astriane Hangars Available, limited quantity. Write Taylor Company 497 So Saginar, Fundat 19, Mich.

AIRPLANES—Used \$135 np. Also late models. Engines. Wings. parts theap. Send 25c for lat Aircraft, 230s W Flagler, Miami 35, Florids.

II BATTERIES, GENERATORS, ETC.

EDISON Batteries: Power, Light. Pive year guarantees. Pifteen year life Complete ligh og squepment Pres litera are Sec-Jay Company 321 Tonkers Avenue. Tonkers. New York.

BATTERYLIFE doubled Courantsed Instructions \$1 00. Betse, Box 600, Borger, Texas

12 BLUE PRINTS & PLANS

RECORD Player; Plays thru your radio filmple and easy to make. Detailed plane and instructions only \$1.00 Jay M Sales Company, P.O. But 87, West Haven 18.

IN BOATS, OUTSGARD MOTORS,

FULL size, cut to shape beat patterns, bineprints 7th 36 feet. Illustra ed "Build a Boat" calaing, 10c (com) ' How to Build Boats" book \$1.00 Cleveland Boat Bineprint Ob., Dest. A-77, Chveland. Ohio

CARBIDS Lights Carbide, Hunting Ko vos. Siceping Bags Army Hunkets. Canteens, Mesakita Pistol Belts, Army Rainron's \$2.5 Boat Supplies. Alan-Clarks On., 56 Chambers, N. 7.7

MARINE Power Easily consect any Pord motor (domestic and foreign) with Osco sarts and his Companie catalog He (ruin) Osco Mators Corp., 2020 E. Orleans & Philadriphia. Pa

BUILD Your Own Boat blue prints, list of materials and instructions for 12' rowboat \$1, for 16 inboard motor boat \$4, Boreland, 250 W 57th St., New York 19, N Y

MAKE 16' Rowboat Biusprint, 30c Way-

MAKE simple, n fty durabout. B seprint 10c Wee has You Box 31 Derroit Mich.

14 BODY BUILDING COURSES

BAR HELLS Ducibbeth Exercise equipment Courses Special affect? Proc busine let Good Sarbell Co., 3361-PS Watson, 5: Louis S M. seours

MANDHALANCING is fun; Learn at home, quickly, Write today, Power, 223 W Vine, Kalamaroo, Michigan

IA BOOKS, PERIODICALS

America China, India. Burma Japan Russia Mataya How and there to apply now Fost war U 8 participat on in world reconstruction and tende demands thousands of American trained mechanica, susuamen, fechnicians empreers forementatorers and business representatives—every trade needed. Our 18 000 word copyrighted increase—compiled from business, professional and government sources cars over 200 his U 8 firms with foreign interests. Sives Job information enjoys bearing and government sources outpeted information climate conditions etc.—vita, facts for your immediate application, 31 00 Return for refund in 7 days if not eater ed. Pa. fit India rial Research Butes 1 702 D Studio Building Portland 8, Oregon

SOUTHWEST Pacific Pictures—Very Intest acenes, series of 11 different packets, each containing 10 actual glossy photographs 21 12 13, of Saipan, Tarawa, Namur, Marshai, falands Admira 'see Solomons etc. 25c single packet & assorted \$1 Special A 1 11 packets \$3 Pos ps d 3rd case (1) desired sirmail, send 10c per packet additional) Satisfaction or money refunded bloyds, 1411-PS Northwest 17th, Okiahoma City 4. Okiahoma.

HYPNOTIZE Anyone! Step by step the secreta of hyproclam are revealed to you as you can hypnot se people many. Think what then can mean to you 364 pages of clearly wretten practical instruction. Notice it previoused from man eving other proper right away? Send for "Fractical Lessons in Hypnotism by Dr. W. ham Cook. Only \$2.00 Ball Square Company Dept. 56-O. 601 Broadway Summers this 64, Mars.

PREE Membership in our Technical Book Club emittles you to current literature fundant action on all your book problems premiums No obligation All books. Technical chemistry physics, plantes sports photography farm in busices sports photography farm in Busices laterages, occultant actions all homerait etc. Free literature sports subject. Modern Technical Book Co. Dept thin as W. sind St. New York 13

WANT to drive a bug like the Greybounds and Trailways? Out our four confidential manuals giving information about all requirements. Contains celf-instruction course helping you to qualify, make your applications. Twenty complete lessons, e.pr. an ed by a Greybound Driver Bus Industry needing operators. All four martials entry 15 00 Chees or money order Acine Publishers. Dept. PhA. Bus 1347, Clarksburg W Va

PORTRAITS of gorgeous girls especially chosen for their beauty and chain and chain for their beauty and chain and chain glossy photographs of hving modes. Each puritain is a distance of learning so different from the ordinary Set of 12 535 at 11 00. Ottowns orders accepted also, for gene Baker, Box 2-8M Merchantrals, new Jersey.

Olamourous Beauties in cuty posse.
Olamourous Beautiching Pennings
surves. The real thing 35 4 2 5 approximate size Each one different. These are
serving pictures of models for admis unity
field \$1.00. No COD money order or
stamps Lin 13 W 27 St. New York City

PUBLISHERS' Here is a profitable market to sell your books' Popular Science read are buy all kinds of books. Ask in for proof and full facts. We II show you how to get more beamess' O. K. Ke Iv Managet Popular Science Classified, 353 Fourth. Are. New York City.

OPERATE Profitable Agency taking subart-prions to all management complete supplies and Wholesale raining isting \$000 magnitude 25c (Refunded first order) New York Circulation Service 36 Church St., New York 7

EDUCATIONAL Books sold cheaply or rented for small fee Books bought Money bark guarantee, 4,000 Bargains Cutalog Free. (Courses Bought), Lee Mountain, Fiagab, Alabama.

21G Profits Taking Subscriptions for all magazines. Agents Confidential Catalog fisting over 2500 periodicals and complete starting supplies Free. Pines Subscription Agency, Flushing, New York.

TRADE Magazines-Business, Vocational, Discreton Current single copies Over 100 Code Pres price let Commercia Enginering Publishing Co. 348 M. British Indianapolis . It discret

MOTOR Books Most complete automobile motorrycle selection in America. Rarorical technical, racing Send d.ma for book catalog Clymer 1126 W Pres, Los Anseses S. Cauf

MODERN Steam Car \$2.00. Floyd Clymer's Historical Motor Scrapbooks \$1.50 postpaid. See our advertisements under Automobiles and Motorcyces. Clymer \$125 W. Pico. Los Anguies 6. Ca.if

MAGAZIKES (back dated) foreign demestic arts, Books, booklets subscriptions per ups etc Cata.og 10c frefinded) Cicerone s M3 First Ave. Hew York 17, New York.

SOOKS (set-of print, new med) quickly supplied, many 15c hargains Catalogue. Mrd West Book Service, 18878 Mars Ave., Detroit L. Michigan. PREE Catalog. Pive Bundred Unusual— Interesting Books. Write, Happiness Socks. PSG, 41 Union Square, New York J. N. T

SET L some of my technical books, main subjects electricity appoind methanica state subject I if send list and price 2369 33rd St., Astoria. N. Y.

CHINESE Physicians Secrets, unpublished history, peculiar healing arts. Lastrations, \$100, Garding Lui, Box 5227 Metropolitan Station, Los Angeles, Ca.if

BEAUTIFUL, Colored, Skid, U.S. Airplane, Pictures, 10c each, portpaid Nebs Bargum Store 205 C St , Rock Springs, Wyomans

PREE Booklet-The Truth About Jesus, John C. Hesk-P.O Box \$15- Baltimere 3 M4

MARGARET B riterson Martin a Ceiling Unlimited Serviceman a guerna 25c. Jackson, Michigan

RACH number magazines reasonable, Reedmor bel interrate Avg. New York, H Y

OUT Of Print Books found quickly Bend Wants. Any subject Resourable. Cul-ton, Box 137700 Beverly Mills. Caul

"BOOKALOG From Books, Opportunities. Enclose stamp. Golden, \$73036 Kelth. Oakland 11, California

PERGERPRINT course, complete, au'henue \$3 00. Identifier, Box 1616, Mesdayport, Conn

MARE. Out-of-Frint Books located, Booksfinders, 1310 M, 11th Ter., Birmingham, Ais.

OZARE Magazine, Lunsdale, Arkansas. For homesockers, apertamen, forkierista. Tear, 81 00

PROOF of Earth's Concavity, 325 pages, \$1, Theography, A1730 Hough, Pt. Mayor, Piorida.

SUBSCRIPTIONS Any Magazine, Trade Journal Printed Catalog 19c Cassell Publishers Service: Westfield, N. J.

LOST Treasure 10 locations in U S. signs. map. \$3 06. G Patterson, 46 Elmira St.,

75 Beautifully designed book labels \$15"22" name imprinted 50c. Ex-Libria, 205 E. Broadway, New York 2. N. Y.

BURBER mude made to order You know our que y Fair tres ment a ways. Plantic Arts Route No 5. Municie Indiana.

Wholesale Retai Parific Book On 2108

ADULT Books, Sample and catalog 16c. Autona Jul Luner burg Mass

BOOK Bargeins Liberrated cataings free. Rielto, 349-A Sackett, Brooklyn, N Y

"A RATIONAL View of Life"-81. Benjamin Scibert Urbana Obia

Orchard Lane. Stillwater, Okla.

ADULT Books Catalog Sample 25c. Lefavor, Boz 220, San Bernardino, Calif

BUILD IT YOURSELF

MAKE Pointo Bakar for electric atove or holplate from scrap materials. Simple construction. For own use and sell to others. Good market. Complete copyrighted instructions, drawings and selling opportunities. \$1. Becker Engineering Co., 277 Broadway N Y 7

RADIO control equipment. Control modear deors etc by radio fiend 25 cents for Instruction Manual to Radio Control Headquarters, Box 214, Deal, New Jersey We stamps.

BCILD Tractors from Broad band automobiles. Convert borse drawn farm equipment into tractor hook up. Westing. Garage East Wareham, Mass.

BUILD Concrete Block Machine. Ensy, inexpensive. Sell blocks, build home, parage, barn, etc. at low cost. Pres details. Morne 208 W Wilder Tampa Florida

LATHE men New toolholder Seven in one. How To Make It, Dollar Warstamp, Allbaugh, 3318 Broadway Hustington Park, Castf

PLANTIC Houses—Band yourself' Resprface old buildingst Wonderful building featerall Write Markensing Service Adwardensie. Li

HOME Telegraph Two complets amplingreceiving sets. Two-way communication, Easily put tegether. Complete parts. 51 00 Robert Hulet, 28A E. 39 M Y

AGAIN Material avaluable for Sun Water heaters. Got plans, Sol May, Daytons, Fig.

IT BUSINESS OFFORTUNITIES

largest industry regularly propious thoumitte of then and women in controls production Possible earnings up to \$5,000 m
for words. Authoritic 7,000 word convrighted report gives job information, union
requirements, against application letter
matter and addresses over 40 Alaska Saitertes. Newset edulon includes similar information on Cautornia Oregon and Washhigton fisherses. Vi a, facts for immediate
application in a permanent industry \$1.00
7-day rafund privilege, Pacific Industrial
Research Bureau, Dept. PS-9, 203 Scalie
Blog Portland & Oregon

CET The Pacts concerning "My View Points about Mai, Order Schemes Plans, Ideas Sales Letters Carculars, Bonniets, Pormulas Advertising Circular-biations and Mai ang Line Rnew the relationship of three Ten Vital Schemes to the Direct Sy Mail Order Business, Send for Pres Information to Henry E. Pilts Publications, Box 160. E. Orange New Jersey

EACH Ambitious Man Should have some thing in set by Hall for extra income every day. Make exira money and buy what you want Read. Mail flex no Is Money Busques. by Housian Ma pin Free sample service bulle in . Let Maapin a Let et On Special ion: With Ideas Bend ... and on card, Housian Maugin. Tipp City 36 Offic.

MAKE new patented spinning toys in your shop or factory. Turned wood or pleaties. Small relative They seel like verse Swift advertising Year around to see Your ticket to prosperity Sond \$1.00 for blue prints and proposition UMA only People are toy hungry and stores are small Act now Clin on Dayldase 536 'C' at San Diego 1, Calif

INVENTORS Attention: Aggressive top manufacturer employing over 100 interested in patented or patentable mechanical devices. Product must be beyond the idea stage. Olear sketches and written description required Your rig is a plan acroputously respected. Write Box 233 Realery Ice. 116 W 34th St. N. Y

COLOROLAZED Concrete Pottery made to boot mode New 100 cost patented method Cemerary products note that the floors, etc Basement lesteening Other money making projects Modelet details free Men on y National Petteries, Pergus Palls Minnesota

MECHANICALLY Inc. ned Men Own and operate general Appliance Repair shop Complete districted course shows you how Welding Raf igeral on Mosor repair flow to get business etc. all phases towared Proc litera una Christy Supply Dept. 735, 2635 N. Central Ave. Chicago.

LIQUID Marks, mow-white, multi-celored Olased Ungland. Composition From ng Lifeling wear Any color No priorites Flex,be mode Plaster casting Del into the big modey now Full information given free Write-Compo-Tax, Box 186-7, St. Louis, Me. COLOR Concrete with Chemicals. Big money making Hollywood style pottery, hirdbaths, without moulds. Wishing-wells, stace-rock. Iwachus. Marking rement water paint. 10r brings sample literature Pictures. Hollywood Cementers. 11, 3636 Wonderland. Hollywood 46, Caufornia.

THOUGHANDS of Alarm Clocks await repairing Jovetry stores swamped Our simplified towars with pectures and drawings teaches you how to repeat these clocks Mecanancy tends and supplies furmated with course Alarm Clock Repair Service P O Box 1963%. Houston I, Teles.

OODD Paying Suctions Milroring mirrors, playing automata, reflectors, before, bethroom fixtures, etc. by into method. No tanks or abop required outfit furnished. Free Bootlet Quamotal Co. Ave. E. Detailer Lands.

MATL Order Business overce shows you how to make money spare or fullisms. Teaches professional mail order technique - not prany-spatching athemes. New Business-Catalog Prov' Write-Melson Company Dept. 4-81 Chicago 4.

START Rome business making statuary, plaques art goods, pottery garden furniture, artificial marble flooring, liquid marble blate flatble moids, pourself Amazing profits. Polder from Crantive Publishers, floor 336 M. Wannetta, III

ELECTRICAL Appliance Repair Open your own aboy Learn house Wiring succtric meters, vacuum cleaners. Washers, etc. Complete sliustrated course shows how Pres booklet Pacific Training School. Dept. AS 1, 4782 W. Pice, Los Angres 6

START a clock shap white check repairing is bonning. Our easy to learn home slindy course with pectures and disstructions teaches you how to repair all kinds of clocks. Information free Houston Clock Shop. P.O. Bon 20062. Margaron 12 Texas.

WANT to make \$100.00 weekly? No Poolin? Details and 60 page book tooled money-making information that can mean immediate cash and secure pour future independence Ruch 25c today. Now Wilkia. 1966-P N. High, Hillsborn, Ohio

"100 000 jobs in Air-Conditioning." Learn opportunities in this immense field. names addresses of major companies, etc. band \$1.00 for \$200-wird report 7 day refund privilege R A Basmussia. 1015 M Majors, Santa Barbara. Caulf

START a bone business in spare time Make extra money Experience not essential Literature free, Rolf S. Iverson, Box 9168 Grand Contral Annex, New York 17 M T

JUMBO Mail' Packages full of Maguelines Margeins offers samples from hundreds of Companies Name Intel 25c National Distributors, Sex 57-PS, Muskegen Meights, Michigan

SELL by Mail to Latin America. Virgin, overprosperous Majorder Plead after no immerse opportunities. Valuable to rior tions explaining how ill Sample Lesson, 10c. Valuate, 135 Breadway New York .)

HEALTH Pirst! New Drugiesa Method Unbe evable results Operate a Health Conditioning C b. No apparatus Metabasic System. Dejill. Station S. Les Anpries.

START Matterder Bookshop Everything furnished publisher cooperation 35c brings booklet eschiute or up samples, eschief ideas Owners; Publications, Caaning I, New York

LEARN Profitable Credit and Colection Agency Business Earn \$5009-510000 ammus to upwards Postes & Street in cresting Literature Press We to Educations Extension Service Dept. 102 Los Angeles 18

START Name Business Making Novelties, Pleases, Somenite Co.orful Liquid Marble Make your own Pleasing Molds We to for Proy Information Sing Products, \$21-J Tremont St. Busing 18, Mags. SELL Cosmetics By Mail, Women spend millions on Beauty Tou can make your share of this Cosmetic Money, Let us show you how Details Free Frank J Arts 1066 Harding Drive Toledo & Onio Dept B.

MAKE and Mold genuine Plastics. Forty Ultratrated Work sheets expenin methods. processes. Authentic, simplified. \$1. From circular. Plastics Digest. 3837D Tracy, Kansas City 4. Mo

BOOKKEEPEN Accountants Double your income operate a problemle bookkeeping service apare or full time. Textbook, and par icusars \$2. Tax-Saver System, Dept. F. Ft. Worth. Texas.

MONEY Now After War What. Giant Collection Of Business Plans Shows How To Make Good Merey At Home With Own B storm Litera are Pres Sirausa. P. O. But 71 Kensungton Sta. Benokern N. Y.

MARE satable articles with real greatforms, dehyde plastic, Only simple equipment required. Fourth pound sample \$1, Cheap quantity prices. Plastic Digest, 3917D Tracy, Kenses City 4, Mo

OUARANTEED powerful mailorder leiters. literature, complete campaigns created. Pamous (or famous teal a Messonable? Investigate! Pinkle Advertising, 1991); S. Ouden. Los Angeles.

AT HOME-your own manufacturing business; making popular \$1.00 neverties Coat you 30 to 150. Everything supplied. Write So-Le Works. Dept. A-861, Cincinnati Ohio

ESTABLISHED disting mail order business from your bome. He canassing States for particulars or send two dit are for complete plane. Case. Box 172, Sentile Washington

SELL Christmas Cards Display Sons, Pictures Cards Socks, Orestans Oards Bug Profit Quick Sales! Octalog Proof E fee 436 W Wells, Chicago.

QUICK Money! Repairing Car Satteries
At home East ton Write Satteries
901 South Avenue, Grand Junction 5
Colorado.

MAKE strange new plastic, \$c ratios—selle 50c. Makes, beautiful, durable floors, walls, roofs, Amazing profits, Bays Laboratory, Oklahoma City \$

"CIL-DRILLING" Expert "know-bow"
Leasing - Royalties, Profitable Procedures, Booklet Pres. Landewner's, Codde.
Ottahema

TYPEWR'IER Repairing Original Course Study Water Typetries Mechanics School Ben 200 Oators, Otto

"MOW to Make Simple Molds and Plaster Pasques Profitable Suamess or Robbit Sonkiet 25c Pastercraft 1466 E. 43cs 84. Cleve and 3 Onto

BYESTIGATE Mai) Order Beiling It a great opening betters containing cash, checks, isomey-orders, Amele your Iriends, Write Young's, Kent 18, Ohio.

IP you'd like to make \$5.000 annually or better, in an easily tearned office bisiness of your own, send for free details immedisicly. O. H. Cole. Pres., Eyracuse 2. N. Y.

er restings Finest quality Samples? Sure! \$4.00 et \$12.00 en.top. W Wooley, 405 A Howett. Peorts 21;

DISTRIBUTE Health Poods, Vitamins, Vegetable Concentrates, Minerals, Pruit Powders, Pres Catalog, National Mealth Products Portland 2, Oregon

BUSINESS Opportunium & Volumes, Morey Making Business Startes 11 Single Volume 25c Burks, 1365-B. Rebson, Vancouver Canada

2011 D Own Business Mailing penny post cards as profitable plane with a formation for starting Gorden Publishers, Box 21 Pawtickel, R. I.

BE independent start own business home, office Pres literature describing over '00 money making plans Zhingulewick Co 141P M Sth St., Brooklyn, N Y

OET Ready for Own Peatwar Business making Venetian Biinds, Illustrated in struction Book \$1.00. Elwert, 5900 M. Ashland Chicago 26

AMAZE others. Add columns instantly Add faster than adding machine. Free details. Maths Institute, Box 633, Mobile 4. Alabama.

MAKE MONFY Used Marnicety Soles Agency Little capital Complete plan \$1.00 Roberts, Dept. B. 425 Beech, Aritington E J

MAIL Order Mirror (Monthly), 348 M Sacke's Brook 30 N Y shows bow to term extra money by mail. Sample 10c, \$1 00 yearly,

WE Start you in Business at Home, Sparetime. Earning \$10-10 Weekly Selling by Ball Stamp Appreciated Juseph Driscoll Bales Service But 277-G Denist Colorado.

50.000 POSIWAM Job Opportunities in South America Send stamped return envelope for Full Particulars. Pan Americana, Box 424 Mollywood 18. Carll

MOID MAKING Pleater casting Meneymaking Business Literature Free. Kemijo Park Ridge Dinois.

RECAST old batteries into new Latest achievements. Battery Laboratories Minneapolis

628. Weekly working two hours daily No canvassing. No Manufacturing Lycks, Bun 1471 Cleveland 13. Ohio

FLEXIBLE Mould Compound Pint \$1.00 Mou de made send mode Winters. \$200 Ye towatune Detroit 6 Minh

MAIL Business Earned \$1400. Monthly Copyrighted Instructions \$1.00. Boyd. 321 Fourth, Pittsburgh 22 Pa

BUILD Mirarle Homer You's Others Chamber am Pitasimons Building Pitts-burgh 32. Pa

GROW Dwarfed trees. Instructions 25c McGuire, P.O. Box 436. Dept -E. Beattle 11, Washington

MAKE and Sell Refrigerator December Complete instructions Sec. Box No. 1, Toughkenamon, Penna.

24 500 RICHER med "schemes from I Schemer Magnine Albance, Obio 47th year \$1.00. Pour samping JCc

RLIEFR Monido Lates models start profitable bis. see Fastern In et Loboratories Buz 153 Ma Lapub 26 Mass

YOU too can learn how to make mold and cast Real Plantics Send stamped envelope Sex 486 Claimers in Texas

LARGE Profits Merenandue Imprints available Write A. ams Eachange. 200-2 W 224'h St. New York 27 N. Y

EXTRAORDINARY Madorder Opportunities. La erat re free Hadson Letter | They Box 127 D Ama videm N Y

pre freme for guerar and cash markets. Bendrixon, Argyle. Wisconsin

1 500.000 ARTICLES wholesale, Beatce merchandise. Directory 10c Prince. Bunnyside F, Indianapolis 44, Ind

1NSECT Spray profitable: Concentrate inatructions, Kapann, 13 & Eden, Bultimore 31

MAKE Hig Money in space time at home Free particulars. Yeamans, 2006 North Ave., Richmond Va.

BUILD Profitable Real Estate Business. Spare Time. Prec Particulars. Cutt, 452 Hambold: B.Ham 14 P Y

PROFITABLE Mail Order Opportunities Vasang Bervick 132-h Washington Hoboken N J

REDHOT Majorder Winner Make for 18c Gallon Bell \$32.00. Progressive Service. 14,2W Great Northern Bldg. Chicago \$

MAKE Sealble molds' Cast plaques novel-'les bookende avec sample S Tuotes. 430 R Ches not Ham ion Obso

NEED Money We have Cure for Iran LEARN Cartoonis purses. Details free. Gailpeter Enterand plans! Has prises, Dept. 166-P5, Nellisville, Wisconsin, 1 coin 3, Nebrassa.

BELL by mail abroad! Plifty million prospre a' Details 19c. MacCormack. 2-F, Madeira, Ohio.

WHOLESALE Directory Ten cents, Volchok, 1996 S. Gerard Ave., New York \$2.

STEP into Job or business you want. Write, Central, Simpson 2, Kansas

BUSINESS SERVICE

CHICAGO Mail Bervice. \$1 Monthly Reviable. Confidential, Faultiess Organization, 3439 Michigan 16, Chicago

CRICAGO Mail Forwarding Confidential Send 25c with letter Blaire s. 4520 Cheridan 40

MAIL Address Service 5, 50 Month 7 Letter 10c. Spads, 10 Lexington, WethersSeld 9, Conn

WASHINGTON, D. C. Receiving and foruniding your main Prompt Service. Service Survey, 160, 25th St. E.E.

IN CAMERAS, PHOTO SUPPLIES

BARD form War time proven Basa maderanip Amazina eriection of finest 21d enterna- Leica Contax. Kottise Reflex. A gus new and used 51s, ata, able Wide for quotations in staction guaranteed or your mines refunded Basa buye em sells am, trades em Mc Pos paid for 100 page book. Matury & News Pho ography by Jack Price Up to the telinute infulmation. Basa Camera Co. Dept. &P. 170 W. Madeoun St. Chicago. 141

CARM! Spot cash for cameran lenses behorizars mone or at a nound projectors
for d in 1 description in male or wire for
prompt tech offer. Over 30 years of dependability inverse honorable dealings. 35c
Postas d for 110 page block. 3d 1 ars &
Kens Photography by Jack Price Units
the marks a viormation. Busic Camera On.
178 W. Madason & Chirago, 11.

MAVE You a camera. Improve your hobbs of photography and has a hum to make bet or pictures. Were rodus for our le est book entains and sample copy of American Photography containing at itler and pictures by the ford a certificial this era and photographers. Camera House, 403, 353 Newbury St. Boaron 15 Mass.

WAR BARGAIN Used Camerna Candid Camera 34 96 Modal 57 90 Graffer 82" 30 Enlarger 313 60. Jamm, Reflex Camerna and many others Movie temera 64 00. Projector 68 00, Holl Plim Send 25c for intent list and descriptions. Used Camera Directory, Box 1021-E. Canton, Ohio

PHOTOGRAPHY for pleasure or grout.

Learn at home Practical basic training
Lorg established school Write for booket
American School of Photography, 1215
Mahaan Dept. 1722 Chicago 6

CANDID Camera, Build your Own Compie's Kit of Parts 33 50 Money back Om at) Free Particulars Houseam Co. Bux T'2 C La John Cant

FILMS for your comers.—All since, one to a curtomer Send four dimes to Films, Box 706A Falem Mass

ONE any ramera with pertiful 36-mm. film? Simple instructions Stanh 5: 06. Tirekop D-9 Madeira Ohio

PHOTO Enlarger Kit. Pree Circular. P.O. Bur 149 Wall St Station, New York 6

CARTOONING, KIGN PAINTING

JOURNEYS With A Cartoonist, biography, travel Cartoon Instruction, information, hundreds of time, a critications like poblished \$3.00 Landscape Painting Course \$3.95 Modern Pro-er Art Lettering Course \$2.90 Cartoon Drawing Course \$1.00 Catalogue 10c Bigns, Parmington Mo

NOW To Make Money With Stangle Cartoons — A book everyone who akes to draw should have I' is Pree no obtination Simply address, Cartoonists Exchange Dept. 1449 C, Pleasant Hill, Ohio.

LEARN Cartooning gag creating, markets and plane! Hartman, 203 W St., Lincoin 3, Nebrassa. BIGNS Made Easily. Instructions and ten sets modern alphabets, numerals, patterns. Sizes up to Englit tithes. All for \$1.00. Co-operative Business. Box 530, Chicago.

CARTOON:NO—Learn at home 16 easy lessons 50c Ca 70cm Mudio, 1402 Charges La Crosse Wasconsin

HOW to Draw Punny Paces 1 Sample Lessons 18c-. Punny Paces, Modeste 1, Calif.

CARTOOM Courses—22 Easy Lessons, 200 figure sketches. 25c coin postpaid. Snask-Park Co., 32 E. Georgis, Indianapolis 4.

23 CHALK TALK BYLNY

CHALK Talks, Laugh Producing Program 11 00 Insultaind Cutaing 10c Cartooniat Balds, Onlikosh, Wisconsin.

25 CHEMICALS & APPARATUS

DO research work for mency is any field of science. We will give you a project to work on, All necessary is some experience and laboratory. New registering fee \$2.50 you receive contract to sign six ne money will receive and we pay labora ory expenses Chemical catalogue its Li treval Chemical Co. Hurbester. New York.

THE House of Winn, the Some of Suppages or Americal Chemists. See Winn's new idea Class cal K to and Apparatus Outher for Home Experimenting Send. 10c for Relail Catalog, John H. Winn, Retablished 1831, Dept. 301, 134 West 23 St., New York 11, N. Y.

ATTENTION Amateur Scientists Once as a count membership in open to all interested Write ammediately for ful, details. Membership Department, Royal Scientists of America. Non-30s, Rephins-tyle Ka

CHEMICALS and appears us for industrial, and viscal and pointe international. Complete supply service for correspondence prisons alude in Send 3c for calling Dept. M-26. Biological Supply Co., 1175 Mt. Mope Ave. Rochester 7 N Y

MANDBOOK for Chemical Experimenters. Hund eds of experiments, illustrated see Experiment Booklet, 15c. Chemical Catalog, 6c. Reading Scientific Oc., Reading Pa

NEW 20 Page chemical apparatus order hook Con mete time of chemical glassware, apparatus and chemicals. Send life for this book Standard Science Repoly Co 1212 N Paulina St. Chicago

100 DIFFERENT Chemicale One outlog or more each Excellent opportunity for distributed laboratory stock M vo Midwest Chemical Co., JTM Berond Ave., South Minnesota

OFFER Mirrors restly made on any glass with Mirror Coppering Liquids Bend 13 00 for four pirt but its postpaid Free information Mirror Chemical Co., 3136 Fig.bush Are Brooklyn 10 N Y

LABORATORY Supplies at Wholesale Frices Chemistry Biology Physics Catslogue for National Scientific Co. 2704 W North Ave. Chicago Satabitahed 1806.

athereus research life by manufacturer for athereus research life by go copy Amateur Scientista Magazine from 73A. Mumphia 7 Team

LUMINOUS Paints will glow in dark, Six colors, Fairmount Chemical Co., 136 Liberty St. New York City 5

CHEMICALS, sunce quantities, Apparatus, Cutake & Pleischer's Laboratories. Everett 49 Mass

FREE Catalog' Chemistry, mineralogy, Biology, optics. Tracey Laboratorias, Evanston, Illinois

SPECTROSCOPE for quick chemical analysis \$2.50. T. A. Cutting, Campbell 3, Oal,

UNUSUAL chemicals prepared to order Bluco, 3031 Dauphin, Philadelphia. Pa.

CHEMIST'S Supply Catalog Sc. Arc Chemical, 1919 Arthur, Bronz St. New York.



CHEMICALS, Equipment, Books, Etc. Special Offers Pres. Hallmark Technicak Supply Co., Jamestown, New York.

VV COIN COLLECTING

WE buy Indian Pennies, Lincoln Pennies, and Old Rave Co in Highest Prices Paid Indian Pennies worth up to \$15.00 each Lincoln Pennies up to \$2.00 each Otter Bare Coins \$5.00 to \$2.000.00 each Send 25c today for New 1545 Price Catalogue of all Wanted U & Coins American Rave Coin Co., Dept 4, Transportation Bidg Chicago 3

147 ANTIQUE Firentias: 4.000 Bergains.
Coins, Indian Relice, Minerale, Cartridges, Raffas, Flintiocks, Fossils, Swords.
Catalog with Photographs 26c, Hetke Wehons, III.

WILL Pay \$16.00 Each For Certain Lincoln Penniss! Indianheads \$50.00; Dimes \$1,000.00, Catalogue 10c. Federal Coin Exchange. B PB. Calumbus. Olio

COMMEMORATIVE B. Columbus Texas.
Cleveland Some Mounts n. S. 10 on Distrated Catalogue 25c. Morman Shultz.
Salt Lake S. Utah

QUICK Service; reasonable prices, United States catalog 10c. Foreign catalog 10c Ben a Coin Shop, 73 W Washington, Chicago 2 Il Inous

FREE! Poreign coin banknote and Coin Cutlectors II ustrated Caus og to anprovel service applicants. Send 3c postage. Tatham Coinco. SpringBeld-Die, Mass.

THREE Poreign Balls and Two Poreign Co.na Twenty cents with new Price List Raiph E. Birshberg, 23 Waverly Ave., Oceanside, New York

TWENTY Different Indian Read Cents 5:00 Price List 3c. Walton Coin. T Water Boaton, Make

WORLD Coins, Large, Itemined, Descriptive List, 19c. Herry Eisbols, Box Setall, Pittsburgh 34. Pa

WE Purchase Indianhead pennies. Complete coin to singue (de. Fairview 371 Breadway New York

80 000 COINS medula papermoney Lists free Coinshop. 5 South 18th Philadesphia 3 Ps.

PREE Latest Coin Price List. Low peaces. Formion, Nov-Box 872, Dayton, Ohio

D CONSULTING ENGINEERS

IF you want an honest, competent and confidential opinion on that radio-slectronic idea or invention of vours-consult us Electronic Standards Laboratories, \$10.00 Boston Ave. Tune, Okin.

TECHNICAL problems invited, reasonable lee C. W. Berger, Chemical Engineer, McPhyroon, Kanasa.

ts CURIOS

100.000 ORASS Skirts Wholesale \$1.45 each postpaid; Free list Tropical merchandles Write Air Mail, Enterprise Inc., Box 51, Raretongs, Gook Islands, South Pacific

DETECTIVES

DETECTIVES Training Secret Investigations Progreprin's East Method Short Time Rewards Home Travel Secret Code Bookiet Free-Write In ernational Detective System 1781-P Monson St. E.E., Washington D.C. 18

DETECTIVES Work home Travel. Experience unnecessary, Write. Wagoner P-125 West 19th, N. Y., W.Y.

DETECTIVE Training, Phillips Secret Service, 1917-C Forth Kenneth, Chicago 30. Illinois.

DOGS, BIRDS, PETS,

RAISE Count Chinchills Embbits Valuable Fur Descious Meat Easily Russed Flowsant Pastime Large Profit Free Booklet shows amaking profits from usual investment. Willow Parm. RISC. Sellersville. Banna. A LIVING with Rabbits and Cuvies. Markets Westing. Magazine 15c. Book describing twenty breeds and magazine 25c Book and magazine (monthly) one year Mr. Address Small Stock, Dept. 5. Pearl River M Y

KARBITS—Point Pres Mant String delictors domestic rubbits Small space needed Rendy market Largest magazine in the industry tells you how \$1 per year Send director sample He stamps, Small Slock Magazine, Lamoni 4, fowe

RAISE Guines Pigs. Make money at home Big demand. Booklet free. Taylors Cavy Ferm. Hapsville, Georgia.

ST BERNARD Pups: Champion sired beaution Franklin Toung, R. 3, Riverhead Long Island, New York

RABBITS: Plemish Climits, New Zealands.
Reasonably priced. Franklin Young,
Riverhead. Long Island. New York.

STANDARD Rabbit Journal, Milton, Pa. J years \$1 00. Sample dime

JUMBO From, Wild Rabbits, Cave Poles, Vol Brashears, Berryville, Ark.

RAISE Pigeons profitable business. Bookiet Dime. Gebhardt Farm, Muscating, Jowa

30 BREEDS - Pigeons Bantoms Pigs. Calalogue 10c Houck s. Tiffin Obio.

EK DRAFTING INSTRUMENTS.

SAVE on drafting materials. Pres estalog. Draftsmen's Supply Co., 22 North Wells. Chicago 6

PRICATION A

OCCD Jobs and a Sound Pentwar Peture await you in hotel and instructional Sead. Men and women — all ages needed for well-paid Bost-loss that offer color excitement. Ever new and fascinating duties, Record breaking business in hotels caubs, it attitutions means even greater opportunities. Lewis School receiving as a far enangers, nasistant managers, stewards, host-makes, purchasing agents and to other types of important positions. These are not temporary jobs but important positions in an essential business that offers apended opportunities in war or peace, good times or had Previous experience proved unnecessary! He need to leave your job to quantly it pood grade school education, plus Lewis Training qualifies you at home in spare time. Our Hatismal Placement Bureau helps to piece you—and our amazing Certified Job Plus—actually guaran empou will make good when placed. Missing behool, Room DS-2766, Weatington I. D. C. (First and only delege) of its time—new in its 20th year.)

PSYCHOLOGY teaches about mind Bisingy teaches about body Bio Psycholagy teaches about powers of mind ever
body Use powers subconscious mind Sesect proper vocation Grow Branden educut m. Develop personality Control emotions. Succeed. Correspondence. Dept P.
Taylor School of Bio-Psychology Chattaments. 1 Teachese.

INVESTIGATE Auto Body and Pender Repear profits. You is he convinced Practical space time home study and resident tourse including metal work apray pair ting westing may help you open your own repair shop or get a good job Machanical to minded men 17 to 57 write for free detain. Utilities Engineering Synthum. Dept 34% 13.6 Beaden Ato. Chicago 14

WRITE Short stories at home for pleasure and profit. Pame, riches and happiress of achievement are rewards to be reasured by students who acquire tested technique. Det free bookiet from home study actual with 36 years experience. Write today Riackstone Sprague Dept. 75, 307 North Michigan. Chicago 1

PANCY los Cream Decorating course, easy condensed lessons \$1.00 E Cook. 7745

WELDING—electric are. Learn quickly by artita, practice at Hobert Welding School Individual instruction at bare cost of materials used the manage brings valuable welding lessons post paid and full particulars. Robert Welding School, Box F-152, Troy, Ohio

TYPEWHITER Repairmen traunily needed.

Earn \$40 to \$50 week y spare time Our say to brars home study course teaches four to repair typewriters. Write its free information. Houston Typewr er Repair Be vice. P.O. Box \$3578, Houston 12. Tellas.

GOOD Used self instruction educational books on all subjects bought soid rent-ed, exchanged, Satisfaction guaranteed, Complete information and \$2 page disserted burgain catalog Free Write Neson Cumpany Dept. 3-01 Chicago 4.

POR an extremely profitable lifetime business, operate a collection agency-aredit bureau. Easily learned. Free loader, Cole Associates, Syracues, W Y

CLINICAL Laboratory Technicians in great demand. We train you to your spare time in your own home. You can pract so while studying. Write for free calasoque imperial Technical Institute, Box 913-B, married Texas.

LET me tell you how to desviop your opportunities get a better job, set better par and win promotion. Tested methods From design. Machado Cons., fant. 338-A E. Jillh St., Los Angeles J. Calif.

"UNCLE Sam" Jobs. Commence \$105 to \$175 month. Men-Wemm. Prepare now at home for post-war exeminations. Pull particulars—list of posttions, Pres. Write today. Dept. O-\$1. Rechester 4. N. Y.

MidASR worry fear indecision, inferiority wase up your mind lie what you draife. Write for free lecture Nome Study Persons Psychology Inc. 231 Starks Side , Louisville 2. Ky

ARITHMMOMETER Calculator Table that no School Chief Shall he without It-send \$1.00 Cash or by P.O. Muney Order to P.J. Miller P.O. Box 206. Winons. Minnesota

USED correspondence Courses Educational and Technical Books bought sold, rented, Catalog free, Educational Eschange, Heragar, Alabama

LEARN Profitable Credit Collection Agency Business investigate Educations Extension Service Advertisement Under Business Opportunities

3Q. Logic, Vocational. Personality tests \$1.25 each. Your capacities thru interesting seventific tests. Analyst. Bok 788, Bev. orly Histo. Calif.

HYPNOTISM --Simple Method-Pull Detail You Hipnotice or Money Refunded Guaranteed No Magic-\$1 00. Deckay Box 456 Douglas & Arlmina

MAKE money fast—fix watches, clocks, free bulletin. Beive Charjes. Winona, Minn

FDR in prophecy Dime "Pre-Dix-It" Monthly, Free copy, Michols, Box 26, Waitham 56, Mass.

HOME Study Course, drugings therapy, Prop literature Institute of Drugiess Therapy Tama 1994

ALGEBRA, plane securetry, trigonometry problems solved \$1 such John C. Ashley, 346 Hamason, Lufkin, Texas.

LOCKSMITH Course Lock picking keyfitting ste \$1.00 prepaid. Miner's Kay Shop, Danadian Texas.

COURSES in 2 Different Traveling Trades
At. \$1.00 Travel Trades Suress. 116
Onliatin St., Jackson. Miss.

SKI L By Mail Big Profits Magastne Teaches How Bampis 10c Auburn Sales On Dept 2ED Auburn Mains

NEW, Used, Educational Books; Courses. Catalogs, dime; Refunded, Westway Edupational Service, Box 58 D, Los Angeles 18.

George Lenhoff Lincoln 2. Nebraska

LEARN Fowerful Mental Telepathy 25c. Eigin, 512 Benton, Nashville 6, Tenn.

ELECTRICAL REPPILES A EQUIP

BROKEN—Burned out Electrical Meating slements quickly repaired. Use new amating Nichrocite Pasts samply overlap and and turn on surrent Family and \$1 00 bil Satisfac ion quatum'eed Armstrong Mig., Box 361-Y, Minneapolis. Mann

ELECTRICAL Appliance Repair Open your own shop. Learn house wiring ever tric motors, vacuum cleaners, washers, etc. Committee illustrated con an altuma how free booket Pacific Training School. Dept. AS-2, 4703 W. Pico, Los Angeles S.

NOW-Repair your own electrical appliances with Chan to Self-westing Electrital Heating Element Flux Instructions, delivered price \$1.00 Chante Same Company 914 South Main. Port Worth Texas.

ELECTRICAL Apparatus of interest to the electronic experimenter. Send for Government surplus list. Paro-Myers, Inc. 81 Reads St., New York T. N. Y.

MICHROME wire and ribbon heating elements. Appliance repair burts. Designs, repairmen send for circular B. Alastate. Box 434 Wordesign I Mass.

ELECTRICAL Trouble Shooter finds leaks grounds shorts in anything electrical Lat. 50 Prepaid. Pres Circular, 511 Q E. 31st. Kansas City 3, Mo.

ELECTRIC Pencis Writes-Engraves All Metals, \$1.00 postpaid, Reyer M/g . 4514-C Octtage Grove, Chicago 13

WATTMETER portable General Electric 1000 watts. New. Bargain. Austin Eldder Bridgeport 6, Conn.

NEW Electric Fans, Rebuilt Clippers-V bra urs Dremel Sales, Racing, Wisc

ME EMPLOYMENT SERVICE

INTERESTED Foreign employment? Thousands jobs throughout world Names and addresses over 200 firms with sample application \$1.00 "We search the world" Worlder World Research Bureau, Box 731, Oladewater, Texas

23 ENGINES & MOTORS

JET Propulation Working drawings of three successful jet propulating trotors which you can build \$3.50 Book. Throny at d. Testing of Jet Propulation Mo ors and Rockets by Zygmant Ponberg. Only book of its kind. Explains the fundamental principles of reartion propulation \$2.00 Price for drawings and book together \$5.00 Money will be refunded a thous question of you return major at within level days Aircraft Jet And Rocket Corporation. 10 W. 13rd &t. New York 1 N. Y.

MOTORS, small 6 volt DC reversible 3000 RPM 2" diameter, short shaft extension, suitable for operating models and gadgets Postpaid \$1.25. Walthers, 235 Erie, Milwaukee Wisc

MODEL, Engines Castings, Supplies. Caralogue 25c. Howardon, P3-2417 N. Ashland, Chicago 14

WINDING Date, listing 226 motors sineld and three phase, \$1.00, Motor Date Not 7631, Kansas City 3, Mo

190 AMPERE generator for weiding \$47.50 Extra Scribia cable, 10 ft lengths \$2.75 Sutier Electric, 1885 Milwauker. Chicago.

34 FARMS, OTHER REAL, ESTATE

HOMESTIES \$300 Convenient payments Ca. formia a finest Ourden Spot On Morro Bay a wooded Shores Wonderful fishing him ing boating Fertile soi, soft water temperate c mate, congenial community Free Literature Richard Otro. \$500-Z Hollywood E.vd. Hollywood 25, Calif

WISCONSIN Minnesota Lake River Frontages \$7.90 acrs. 3505-C S. Hope St., Los Angeles, Calif GOOD Farms—Ranches Washington Minnesota, Montana, Idaha. Oregon North Datota Dependable crops. Invorable cima e Write for interactive lists describing typical forms Specify which state J W risw 126 Northern Pacific My St. Paul, Minn.

STROUTS New Pail Farm Calaion Just :
Out! Hundreds of bargains from Mame
to Florida, West to California & Oregon
Save Time, Gas. Money Write today for
this Sook. Press Street Resity, 252-ZB 6th
Ave. New York 10. N. Y.

OCARK Lands for all purposes. Actual River frontages, 6 acres \$75.00 and upwards. Pres list and literature. Hubbard 424P Minnesots. Ave. Ransas City 4 Kansas

WORLD & Salest Investment: 1392 rich seel acres 1,50 cultiva ed substant at thiprovement a succ. profitable decome Drinde New Bockford, North Dakota

OZARK farms, ranches, timber, resorts List free Farmunder, Lousdaye, Arkan-

FIELD GLASSES, TELESCOPES, ETC.

TES FACOPE New powerful & note target a section pre-war lifeting construction Has scientifically ground 31mm for a Length closes, 412-in, open 9-in Only 9. 29 passpared Money back guarantee Utics Mail Order Co., 923 Eagle St., Utics N. V.

LENSES, printes, optical specialises. Not Salvage, Not rejects. Not Junk Highest optical perfection. Nothing like this ever offered before. Fraction original cost Send for new optical estates 10 cents Rose 66 W 2 Way N Y C

MARE your own powerful efficient as ronomical telescope. Perfect touses and ristill total 50 % \$1.00 ±10 % \$2.50 ±200 m 33.50 ±10 % \$33.50 Instructions along ±00 Call James Manors the N. Y.

ASTRONOMICAL telescopes Microscopes Cameraa B socidars Books Be get in d repaired I say for Specify instanment wasted Rammasen and Reece 41 Market Amsterdam N Y

LENSES Prisms - Telescope Mirrors -Telescope objectives, Send for free list. Marfler Fred. Extensib, N. Y.

REAL 17 power telescopes 53 United 2309-C Lawrence Toledo Ohio

FOR THE HOME

REPLACEMENTS -Stores Purnace Grates Purepota Linkings - Magipuodus
Roya, Oak Michigan

FOR INVESTORS

tion has to protect and sen your invention. We a for free Record of Invention for making disclosure and establishing data of your invention. We also send our new free Patent Guide for the Inventor containing tomplete information about patent procedure and how to sell inventions. String limitations of many successful inventions over 150 basic inchanges more ments. We assure you prompt confidential service Dulays may be dangerous. Write lodgy for your free Patent Guide and Record of Invention form Clarence A O Brief & Rarrey Jacobson, Registered Patent Attorneys, 32A-J Adams Building Washington, D. C.

WHERE Can You Sell Your Ideas' Blave you a new idea, an improvement, a device of utility or noverty? Want to know where to sell it? Learn the facts first about its patentability. We have set ers from manufacturers wanting new patented ideas. The present emergency market has created a big demand. Get our Pres Book How to Protect Pinance and Sell Your It vention. Ho obligation. Medicorrow & Berman. Registered Patent Attorners [4] h. Attentic Building Washington 4. D. C.

RANDOLPH & Beavers, Registered Patent Attorneys, 340 E Columbian Building. Washington, D C In order to Protect your invention and reap the reward that should be yours, Patent your invention without Drisy, and at the same time have Rights to sell as Manufacturers convert to Civilian Production Write for Information and Record Form To-day

INVENTORS—We will help you if you have a good idea. We supply the finances to petent your idea in your own name. You own the patent We also arrange profitable manufacturing connections for inventions. While with a obligation Patent Finance Corporation 2000 Hospital Trust High Providence 3 R I

INVENTORS Take No ice Have your inextor as a fed for a a potenta, morely making posa by tea I have helped officers, or he help transitionally on fidental Technical Service Donald Chimitoca, Palent Analyst, 100 22 97th Ht., Ocopa Park 18, N.Y.C.

INVENTORS I specialize in Patent Office searching You are invited to call any evening and talk with me personally Phone Decaur 5305 Washing on D C., or write Raymond L. Smith 102-A Bond Bidg. (Former U S. Patent Office employee.)

INVENTION Developing Designing, Sales Promoting Model Constructing Patent Beats ies A then is Massiactivers Mading Units Five In earlier Development ." "To Mission Bird Granada N. In California

WE locate buyers meritorious patented, unpatented inventions if will sell reply immediately. Descriptive booklet, references, free. Invention Reporter, 3A-11100 S. Fairheid Chicago.

INVENTORS We make working models or individual parts of your invention of idea. Send aketch or blusprint for quotation, F & H. Machine Co. 134 W. Broadway New York 13 N. Y.

"NVFNTORS New m, tary and commerc at inventions urgently needed by margifacturers. Write for particulars. Observed insidular Dept. 1 A. Washington D. C.

(WVENTORS! Have you good patentable idea? Write Mr Metaller, 11 West 12nd, New York

\$2,000 YEAR aideline easy, inventing simple items for guaranteed cash markets. Rendrison Argyle, Wisconsin

CASH for practical ideas and inventional Mr. Bail BB 1141 Picasa's Chicago

W. FORMETAS, PLANS, ETC.

RELIABLE Pormulary 934 base illustrated book 19000 scientific formulas, recipes, secrets, instructions for most any product. Cast these profesible bus ness opportunities, aid of D.D.T. new maser saide that eliminates flies manquitoes, moths lice, fless rouches bus etc \$2.90 postpaid (cod U.S. only) Portion \$1.20 delivated Adams Brown (to Dept 450 Chestnut Hall Massace sects

industrially used formulae now available! Manufacture your own products thing our formulae. Any formula \$3.00. Miner back guarantee Free constant at a with each order K. D. Harr Formula Laboratories Dept. A. Box 290. Norwalk. Oh o.

PREWAR Tire careasses everywhere, from here for a m pure rubber, to make me da tire play ie. gic. Details for stamp, Belte. Box 699 Borger Texas

PORMULAS—All kinds, Latest moneymakers, literature Free, Kemilkel, Park Ridge III.

PORMULAS Latest, best Analysis, Literal are free E. Beilort, Engineering E | d.ng Chicago 6

ANY Formula or trade process supplied, 50 cents. Jackson, Newfoundland 4, Ky

FRUITS & FOODS

WHEAT Germ Unexcelled quality 21/2 jbs. \$1 00 postpaid Health-Wheat On., Rochester 3, N Y

FUR FARMING

GIANT Chinchilia Rubbita, Valuable Pur Delicions Meat. Easily Haised. Pleasant Pastume. Tremendous Demand. Small Investment. Large Profit. Widow Parm. R.4 Sei ersyl is, Pennsylvania

RANCH Mink mutations and naturals, top quarity Priced right. Carlson Mink Farm, Stromsburg, Nebraska.

41 GAMES, ENTERTAINMENT

PABCINATING Fun with Thirteen Rummy Card game Polding Felt Board with 350 chips for \$1.98—money back if not satisfied D Autremont, Dayton 2. Ohio

AD HANDWRITING ANALYSIS

ANALYZE Handwriting, Unstaited opportunities in uncrowded profession. Complete Course including free handwriting analysis \$1.00. Mayer, \$61 Market, San I Francisco 5 Canif

62 HELP WANTED

SALESMEN - Executive type Sell surplus antings business man only. \$100 day W.re-write quick. War Surplus Reporter 26 E. Jackson, Dept. 11 Chicago.

RELL, Kayo Baim for Cold, Headaches, Rhenmanica Other Produc a 5 f as same ples. Rayo Chemical Corp., 334 Union Ave., Brooklyn 11, N Y

SALESMEN Saleswomen Seven cary sales of daily pays \$200.00. Weekly commissions Royalty, Sox 1060-G, Newark, N. J.

44 HORBIES, COLLECTIONS

22 BEAUTIFUL Audubum Bird Frints, F 2 12 2 full cutors on finest paper ideal for framing Home Office Club, School, Den Stores Am Gris \$2.95 Postpard No C O D a Create-Andorer 4158 Lexing-Lon, New York

COLLEGE Poleign Mattery Inagulas and War P moners Embler in Prices Samples 13c Hosbyguild P-35 West 12nd St., New York

RADIO control—the hobby of temorrow Bend 25 cents for Instruction Manual to Radio Control Headquarters, Box 214. Deal, New Jersey No stamps.

UNUSED Match Book Covers 100 all different \$1.00 35 Royal Frash Covers \$1.00 Pree Lat Charges Edelman, 1311 F East 64, Coversand J. Onto

COLLECT colocial army pa ches Latest p cture book and catalogue only its. Insignia Mart 703 Broadway N Y

JEWELRY stones removed from rings, etc., 100 assorted \$2 to, 50 large ones \$7 to B, Lowe, Holland Building, St. Louis I, Mo.

HOBBY catalogue 10c Reptile List Sc. Chambreon 25c. Quivira Speniarian. Topeka Kansan.

EXCHANGE duplicates. Swappers everywhere List free. Box 2164-B. Denver 1. Colorado.

45 HOME CRAFTSMEN

PLEXICLAS and Lucite—The amazing organical olear plantics. Sow, drill, bend or twist them into hundreds articles that are beautifully difference Special one pound assortiment including cement project drawings complete his rot tone only \$1.25 Bix pounds \$5.00 25 pounds \$18.75 Masked sheets \$1.2 k 12" 1144 square inches") at \$1.50 3 at \$2.75 \(\tilde{c} \) at \$3.00 Past acting rement \$1.00 Red blue, yellow dyes \$1.00 each. Polishing Compound \$5c Send no history Pay postman cost and charges in the every Satisfaction guaran sed Calmon-Bronson 1854 E. Third St. Mount Vernon.

28 LAWN Ornament patterns 25c Other patterns 15° 20° high Dutch ged. Dutch boy pirate buil terrier Mexican girl. Mexican boy dwarf penguin flower girl. Oceach, 3 for 25c. 25 novelty patterns 36c. All 92 full size patterns 31 00 postpaid Strother, Box 383 HN, Bellington, W. Va.

CATALOG Patterns paywood Novelte Furnature Letters - Numero a - Ping es Frames - Weathervanes S, houseles Laws Ornaments 100 Books & Bookset's on Crafts & Hobbies Puture Practe Mondings Tooks Large are Deca Trustern Other Unet. Handreds articles Snely Usustrated. Write We Met Shop, Ashburn. Georgia

PLASTICS—Plexiglas, Lucita, Bakette.
Lamarith, Ethocel in sheets, rods, tubes
and at La Fine assor ment of a anderd
sites Cements does and other plan ratio
place too! Complete lists for Currien
Bronson 1854 K Third St Mount Vernon N Y

PLYWOOD—Beautiful nonpriority afteraft tabinat and paneling atock. Thicknesses I 16" through I" large amail panels Fit Gum. Birth Mahngany Wal' it Reasons able! Complete hats 10c Carmen Brocson 185A E. Third St., Mount Vernon, N. Y.

TOYS Eastly made from Scrap Wood, 15 patterns 25c. Novelties made from Scrap Wood, 25 patterns 25c. 15 fawn ornament patterns 25c Plastics, metals and other traft supplies also available. Send for Latt Lands Medway MAN

LUCITE Plexiques Pieces book of the rections and projects 3 colors die centers \$2.00 postpaid O K for overeran Barnett Specialty, 3610 W Third Lon Angeles 36 Calif

TOT patterns. Circus Wagons, trucks, carts, pull toys, etc. 18 patterns \$1 00 Continents; Products, \$07 Herch. Est Clairs, Wisconsin

ARTIPICIAL Leather Pabric Remnants suitable for home craftamen, etc. Poundage lots, Price list on request, Lyco Supply Co., Box 214 E. Weymouth, Mass.

WHITTLER S-30 patterns instructions.

X Arte knife wood \$ 00 Old Whittler 1602 Charles La Crosse Wis

MAKE Shell Jaweiry. Material furnished. Tell-U-How with orders. List free. Dixie Shell Service, Sebring Fla.

Novelty 20 Schouette, 21 00 Modern Woodcraft, Sagmas, Michigan

PICTURES For Framing Three Samples 19c. Cartis Specialties. Box 1812 II Denver Colorado.

PLASTICS All Types Remarksby Low Priced, Free Listings, Orașt-Plastics, Bok 1298 Somerville, N. J.

PLANS—30 Toys 19 Pusses, 10 Lawn Ornaments, in wood, \$1 00. Winfield Hess, | Dept 10. Dover No 1 Pa.

MYRTLEWOOD Turning Blocks-Prices on request. Box 1146 Multinomah Oregon

answer Money making Opportunities.

EM INFORMATION

OUR 44 page directory W.H Save you Money Lists have and address of him-dreds of firms siphabettes ly and other valuable information. Recommended by thousands Satisfaction or refund Postpaid \$1.00 U.S. only Prompt Service Stark Book Co., Miller Arkanasa

DRUNKENNESS Is a disease which responds to treatment Medical skill plus burnes sympathy prove successful with liquor and drug tasts 60 years experience write for free booklet P. S. Nelson. The Keeley Institute, Dwight, III

100 BillLION Dollars of Government Burplus Goods to be disposed at For important information and addresses of government disposal offices send one do lar to Consumers' Procurement Service Post Office Box 720, Springfield Mass.

INVENTIONS WANTED

INVENTORS. Have you a sound, practical invention for sale, patented or unpatented. If so, write Chartered Institute of American Inventors, Dept. J.C. Washington, D.C.

MAYUPACTURER desires postwar produr s in make sing sell through drug,
hardware department stores and mai, order Or will handle mies only Reputable,
hathmally known prest sation capable of
pir thoting pation-wide sales as well as manular are of thems. Prefer non-electricat
products of metal, glass, plastics, sto
will e. Box Ahis, care Popular Science
Monthly

INVENTORS. Attention! Large manufacturing meets stopics as 1400 acts on tire y engaged in that work is interested in the yellowed and patent ship electrical and mechanical desires of me all or plants arvites correspondence with inventors having something note and or some I for Mig Corp. 115 S. LeSaile. Dept. B. C. Chicago I II.

WANTED Paterned unpatented invenfluin having profit possibilities, all kinds. If we see reply minediately Descriptive washe references, free Invention Reporter 3B 1-106 S Pairfield Chicago.

bESD your ideas on new inventions 15 commission if the sale passes through our hands Patented or unpatented Albert O Burns, "The Nation s Gadget Chief", Alamieda Calif

INVENTIONS Wanted Patented Unpatented Confidential Negotiations -Patent Assis ance Name and at Rosal sea Hersett Mis Co. 3333 N Occols are Chicago 34, 111.

KFW Items Wanted for nationally distributed Young Town Toys, If you are a model write at once, Your rights fully protected. Box F. Youngstown Equipment Co 11t Berkeley St., Boston Mass.

CASH for Inventions Patented unputented Mr Besi, EC-9441 Freezant. Objction

thvknTlOns Promoted, Patented or Unputented Write Adam Pisher Company, 153-A Enright St Louis, Mo

WANTED--Practical inventions Inventors Exchange 336 (3) Pausce Bids., Hartford J. Comp.

CASH for plumbing specialty inventions (bucago Specialty Mig. Co., 2954 Lawrence Ave., Chicago 25, 11).

WANTED—Inventions including military patented since 1930. H R Boger, Waynesville. Ohto

e jewelry

GENUINE diamonds, out of pawn for prices, wonderful values. Unredeemed loats and big buying power enable us to offer beautiful grains at prices far seas than or ginal cost. Shapped Free for Inspection, Appraisal. Send for Big Free is, above in fine diamonds at startling low prices. Load J. Butler, Pres. Prudential Loan Association. 33-TK N. Clark Bi. Chicago 2.

CERAMIC Jewelry Supplies, Bar Ping, ear screws, for ceramic and woodworkers, also, glass and sea shell assemblers, Presentation Philadelphia Badge Co., 1007 Pilbert St. Philadelphia, Pa.

AA LEGAL DIRECTORY

PUZZLED? Digest of Divorce laws every state in country \$1.00. Liberty Co., Brookline 46. Mass.

MEXICAN Law Fractice, A. B. Flots, Bolt 23d E: Paso, Texas

MACHINERY, TOOLS &

THIRD hand for \$3.90 with foot or knee operated Smath Swatch Frees hands for smarking More production Jam effort Saves electricity Ideal for start-and stop operations Drill Presses Uninters, Beach Pipe Machines Photo work X Ray etc Tested to 40.000 operations daily over year at ill going! Only \$\frac{1}{2}\pi^2\start

GEARS — for Inventors, Experimenters, Model Makers, Schools, Work Shops, Laboratories, etc. Government surplus made of Brass, Bronze, Dural Steel and Stainless Steel, 12 Matched Pairs—24 Ocars—Bevel, Internal, Sour & Ratchet,

Ocars—Bevel, Internal, Sour & Raichet. List Price \$12.05, Our Price \$2.56. 25 Matched Paire—50 Gears, includes larger gears, also sets of Worm Gears. List Price \$10.05. Our Price \$8.00 50 Matched Paire—100 Gears, better assortment, also Crows, Hellical and Worm Sets, List Price \$75.00. Our Price \$10.00, Limited Quantity, Order Now Note, these gears are sold in sets only as listed above. Met Eschange, Dept. Shi, Jil Cana, St. New York.

USEFUL, Practical metal or woodworking tools—Male, Shapers, Drill Presses. Vises and many others — quickly built using Lewis plain or semi-finished castings, supplied with materials and bineprints. Cost a fraction of comparable finished took bineprints only available at nominal cost, find 10c to cover cost of mailing Catalog describing Il Rems Lewis Machine Tool Co. Box 106 Station A. Dept. 5-36, Lin Angeles II Catalogue.

UNIVERSAL SPC Tool Set \$14.65-16 Pe \$19.85 Wiench set 6 pc Busend \$7.85 -Openend . . \$6.85. Combination Box & Open 6 Wrench set 8 4 to Midget \$4.5 or \$4.5 Socket Set & Case \$29.85 Finctor \$4.5 16 Pt. Surket Set & Case \$29.85 Finctor \$4.5 16 Pt. Surket Set & Case \$6.55 Immediate Shipment—Out ad Mais Check New Universal Tool Co., 1527 Orand, PRM Kansas C sy Mo

INDEX.—Heads for sale. Very inexpensive, Exty-two different divisions, Used on affin I is hes, drul press, it and machines etc. Make gears, hobbs, cutters, etc. Very acturate, and darable. Not a toy. Used by defause schools and hobby ste. Write for free forder Lung 1 Index Heads, 2117 East, B.St., Torringion, Wyo.

I sell Tail Pipes and Smithy mofflers. It is nice to have a Duel on your car. I put 66 Duels on seat mee. It Busy als the time in our shop A complete due, job roats \$50.00 if done here but you can order all the parts and do it yourself Write. The A long Mulder Shop, had & Ash St. San Diego Cast?

EXPERIMENTERS— Repairmen Crafts men. 400 valuable new apriors 75 kinds numerous asses. 10.000 uses. E. 00. Utility assortment. 21 00. Deluxe secretment, 21 00 Jumbo, 25 00 Ouaranteed, Technico, Box 246 West Hartford, Conn.

FLAWLESS hand took for master instrument makers gunsmirks geophysical and electronic apparat is builders and servtremen Send for relating Electrical Specialist Service, Box 2363, San Antonio, Texas.

DRILL GRINDER-Orinda drille to faclory accuracy Calipers with direct reading scales. Circle outters. New Tool grinder Lowest prices Free literature. Pactory. \$11-A East 31st. Eagust City 3, Mo.

BALL Bearings—all standard makes. Can aupply from large stock promptly flave 50 to 50%. Pully guaranteed. Write for Bulletin Met Eschange. Dept. \$M. 323 Canal St. New York.

BUILD Quickchange Gear Box for your 12' Craftaman lathe Complete diawings, Instructions \$3.00 Stevens Engineering, 2004 Military Los Angeles 34, Calif

HARDWOOD, Plywood, War Surplust Low Prices for Munufacturers, Toyshops, etc. Cleary Co., 66 Schubert, Binghamton,

HARDWARE, Machinist Tools, taps, drills, saw ma drels also? Cutaing the refunded Terek Howe 6306 Pacterson, Chicago 34.

POR Sale Used Poley Automatic Ricetric Saw Piler Also Retoother C. J. Lee. 113 S. Palm. Proce. Texas.

SEND \$1.00 Receive 6 pr. New Gears Assorted. Max Estreich, L58-05 Liberty Ave, Jamaica 4, N. Y Prom Oil Drum, Gearless, Plane \$2.00 A. Milkos, 8802 Corwin, St. Louis 21, Mo

BRUNG Adjustable Hole Cultors" See our Ad Page 253

JOHER NOVELTIES

500 TRICKS you can do! Douglas' famous Catalog of 300 Tricks now only 10 cents America a fastest service on single for pocket perior stage profusional amateur Douglas' Magicland, Dansa,

Abriol. UTELY No Trick? If You Can Memorine my Magic Calendar (Size 3'724') inches: you can B ndfalded) tell the day of week for any date w him 100 years (1800-2198 \$1. sech, 3 tey \$2 hoy Gun Rush, Tetal.

AMAZE' Myst (s. Hapnothe: Become Magician or Hapnotat' Kara Big Money' Past nate Priends: Half Pound Circulars Listing Hundreds Revenling Books Star-Ling Secrets 26c Neimar 2001 Milwautee, Chicago Lis

TRICKY Match Hoz, it turns around! It stands up! And it opens, most wetrd uncanny magic poreity trick. Complete ready to do 25c The Magician 2461 K Esnaington Ave Philade pina Penns

AMAZE friends: Your pame in light on famous Broadway theater—features as mastern Professional plus cerapts \$1.00 Rickarbs 603 S W 1.5th New York 26

MAGICIANS', Cambiers' secrets exposed. Cards, Dice, Punchboards Slot Machine Catalog 18c, Book Co., Box 67), St. Louis 1 Mo.

ATTRACTIVE Magic Kit of 16 tricks 12 50 vs.us) 31 00 personid Magic Moreity Co., 6751-B Colbert & ...

54 CARD Tricks and our intest catalog of Mag c Tricks only 25c Bai Square Company, Dept. 11-O., 607 Breadway, Somerville 64 Mass

FREE! Large calming of manipul upperatus
if you remit 25g for book "102 Easy
Tricks Rubbins Co 182-6 W 42nd 81
New York

BE a Magician. Large professional magic catalog of le est ricks 25c Ireland. P. 30 North Dearborn, Chicago

MAGIC Package 25c, 35 easy tricks \$1.00 Landborst Maste Den. 513-P.C. Pine. 8t Louis Mo.

VANISHING Quarter and Ession 25c Sterling Magic, 247 John R. Detroit Michigan

#10 new magic magazine 10c Lucky charm prise contest criming included Don Phoebus Box C33 Irrington 1, N J

AMAZE and mystly your friends with highest quality magic New catalogue 25c our Masta Magic Co Pond du Lar Wis

TRICKS Secreta carde punchbourds etc expained Big theoremed etreular from Mack Box 1276 F San Prancisco

to MACIC tricks and Catalog, 25c Magazal Enterprises, Levering, Michigan

MANUFACTURING

3.7

MANUPACTURE Paints. Your parage a far of: No equipment tapital needed. Industria, Chemist 1828 outs, Kenosha. Was

MODELS small for manufacturing, metals, plastics, etc. Milburn, Burkmeton, Kentucky

FF MILITARY INSIGNAL

STLE Embroidered Emblems, Sample and price late 18c New Insignis Guide 10c Insignis made to order Hebbypaid EM West 12nd St., New York

PORTION decoration ribbons, insignia lists, sample 20c. Insigniacraft, 236-28 Ave., N. W., Calgary, Canada

FOREIGN Insignia Packet and booklet. \$1.00 Insigniacraft, 236 28th Ave., N W Cougary, Canada.

MILE COATS

PREE Postcard request brings you book about dairy goats and sample monthly magazine (Subscription 0) year's) Dairy Out Journal Dept 568 Columbia Mg

C MINERAIN & PRECIOUS STONES

201 ARTIQUE Pirecrus 6 200 Bargaina, Coine, Irdian Beics Minerale, Cartridges, B.See, Flintlocks, Fossile, Swords, Catago with Photography Se Heike, Wenuns, II,

CUT your own gest stones with a B & I Gest Maker, all necessary equipment, less motor and belt, \$29 \$0 f.o.b. factory, Write for literature, B & I Mig. Co., Burlington, Was., Dept. M

OARNETS' from Aritona Desert, Packet for Quarter Mineral Specimens, Box 3651 Phoenix Artions.

FOUR pieces colorful Agate \$1. Rock-hound, Box \$55, Grand Junction, Colo.

MASCELLANGOUN

Marier Chap Fire Compand by Hulp Consoli A processional review of the Compand by Hulp Consoli A processional review of the County Material for an branches of the thea ichia Yuu too can now be a p. o-festional master of ceremon es Comedian, Madio star a er distres speaker etc. Nin I thru is now ready to different from I thru is now ready to different from I thru is now ready to different from I thru is now to be an finces \$1.00 Process Sentth, 200 W as he Dept A. Hen York is N.Y.

ARMY GOODS (USFI);
RAINCOATS \$1 Paras Suits \$3 Jeep Hats as a Cape for Overses cape 100 Dungarees of Cape mask cape 500. Steel Heime a \$1 Gun autima '50 Holeters '50 Can sema suc U apt 150 Mesa h a 150 Lengt as 250 Cartridge beca suc Manmars at propert \$1 No COD N Y Marsace. 144 Chambers St. N Y C.

TAILORED Horses plan-book, Sixty floor plans one-story houses with choice of new amort exteriors styled Colonia. English, Spanish, Moderne making hundreds of combinations, Price 5, 001 Select hor as steeping thousand the spaces of thousand the property for rationing plan how H P Jones, Architect, 466 P B. Brandets Bidg., Omaha 2, Nebr

MYPNOTIZE People Easily! Twenty-five simple leasons (tilly illustrated and clear-ty written show the most modern methods known. Get yours today! Only 50 cents. The Archer Co., Dept. 9D. 83 Federal St., Sector 10, Mass.

1P you have a hobby with commercial posabilities of operate a small burnish which developed from a bobby I am interested in your story. Cash awards will be paid for acceptable major a Write for particulars. Leon Curier Publisher 28 K. 15th St., New York 16 N. Y.

DOOD "Used" self instruction educational books on all subjects bought, suid, rent-pl exchanged Sainfaction guaranteed. Complete information and \$2 page strated burgs in catalog Fire William Company Dept 3-01-3 Chicago 4

DRUNKENEERS is a disease which responds to treatment Medical skill plus human sympathy prove successful with hunor and drug cases, 60 years experience. Write for free booklet, P. S. Nelson, The Keeley limitatie. Dwight III

BOY Scouts—Campers, U. S. Army Surplus Used Equipment, Pup Tents \$2.86. Canterns, with cover and cup \$1. Mees Kits 73c. Packs \$1. Complete set \$5. includes cartridge belt. Samet Saiss Co., Righ Point. N. C.

MEDICAL Laboratory Technicians in great demand. We train you in your spare time in rour own home You can procies with studying Write for free calciogualimperial Technical Institute. Box 313 S., Austin 5, Texas.

IMMENES Profits Distributing Handmade Cigars, Wholesale, Retail, Under Your Own Brand Tremendous Demand Steady B siness Instructions Explaining How \$1 Describite in cratury Pres. Valleym. 198 Broadway N. Y. 13

TRADE Magazines—Business, Vocational.
Diversion, Current single copies. Over
200 fields. Pree price-list. Commercial Engraving Publishing Co., 348 N. Rister,
Indianapolis I. Indiana

INACIMETA' Report or money bork No. d de exercise mantage or troublemonte me aids Simple ta a.s. prope post in Par. Instruction 6 00 Marly 1900 Parm, Ban Matta. Ca. 5

Aiff Circum ing Proplete provides superior fuel times on the array was early weld your own or have it done locally Compele parts descript in and pict graphs \$2.00. Graphes Rt 4 Problem Cont.

Closing Out a wholesae prices at new to be an ing (Mimes graph on Machines Steinesa I has Lint Free Ma dep Speciale by Co. Ma dep 1 N. Carolina.

NEW toys in word or areal wab ad Let us be sold daily burne of mail fact for Berd ashippes to C : Machine Co. 368 E. Tallmadge Ave. Aktob. On o

BOMPTHING to thick about the Why of it imake y Historical egendary occult tasks Pirat, Talk 10c. James Afred Ross. Dept. B. Son 1668 New Orleans.

RFC EIVE Main Money making Opportunities say are due of Y at hance to pear as him grished life Rodgowski 3415 Brow-tway New York 31

JUNT Your Ideas for simple household and workshop inventions can bring quick mass of from guaranteed cash markets Will P Hendrickson, Argyle 8. Wisconsin

PYRAMID Plan sells 'an thing' by mail of agents like windfire! Worting training-tions \$1.00. MacCormack \$10 Magena Obto

TROUBERS permanently crossed Purested process. Send trousers and \$1.00 to Evratey Greats, 500 Joseph Ave. Ruchester N Y Returned promptly prepaid

BrEOIAL* Sun-Gasses-With-Certified-Infered long. Barges. Har \$2.00 per Pair Two para \$3.50 Summers Summer Glasses. Box 267 Center Texas

WELDING Instructions and sample free Repairs broken electrical appliance heating elements. Enclose stamp. Raymond Dow 17 Park Row (1216A): New York 7

books quickly found. Send wants. Clifion, Box 1377psm Boverly Hills. Call.

MONTHI Y awapper's gu de sent for your ast and quarter, Swap Shop, 433 Marhewson, Wichita 1, Kansas

INPORMATION Locating Articles Products (Wholesaie) etc. Rakes. Hox Q-5631, Chicago 80

MEXICAN Miniature Potters Deniers list. Mexican Products Co., 126 N Main Tuise J. Oksa

BASHFUL? Nervous? "Pears?" Free, encorraging a formation, John Linguage, fronwood Mar.

RECKIVE mails, literature, opportunities, Your name in numerous matling tists 10c. Oreenwood, 271 Broadway, New York

CUTTERS Dental Burn assorted reclaimed job-lot, \$1 90 per gross. D'Wolf 1834 E. Rartiene, Philadelphia Pa

AMAZE with Supermemory' Pacts, Squres, names stick like burrs! Write 89 Thor Books Box 1210. Chicago

Oet big list. Surplus electronic parts, instruments Praction original cost. Quest. 360. Great Neck 2, N. Y

ALASKAN Offic and Souvenirs, Priced accordingly Letter forwarded 50c. Box 676, Pairbanks, Alaska

UNUSUAL Novelties samples 10c. Modern, Box 2, Station S New York 2. SHOE Shine Outfit 25c postpaid. Fesential Products Co., Williamsburg 3, Mo.

SQUARE Dance instructions cade 25 sets. \$1 00. Ourkings, Lonzonic, Arkansas

M MODELS & MODEL SUPPLIES

CATALOUS (Histirated) for Modeliers' Airpiance 65 page book on Soulds. Feathers come ruction data apecial attoria, camouflaging the Randouds 128 page HO guide Equipment accessories fit tings 25c (includes reland enuper) Send com or stamps for each products 1 a trated on alog desired Phila a Nation & Leading Hobby House 114 P Filth Ave N Y C (1)

SHIF model kits and fittings Complete and Pisher model jackt equipment Au-Boucher Pisher Marine Model and Ideas Kits fittings and blueptints at standard prices Mess complete stock in New England Send 10c for price light James Boss & Co Inc. 230 State St. Boston, Mass

NUME and Yorks Model Stitings and h unpublic Hundreds of Lema to change from Send for our War Time Supplement, A. J. Filter 1002 Erowah Ave. Dept. W-S. Hova, Oak Mich.

MOST complete Litertrated Catalog O-HO OO Model Rathroad Parts ster published Send Sc for ma ing Sets 1377 Chies Avg., Dept. 821, Brooklyn N Y

WORLD'S largest selection model engine castings and drawings linus tated a a locus loc. Warne Maller Be le Plane, lows

RAJEWAY Models complete line informaing catalog HO and O Gauge 19 pages 25c Walthery, 200 Evis, Mi,waukee, Wigconsin

RADIO control for your model. Send 25 re. a fo leafraction Manual to Radio Control Heado artera Box 214 Deal New Jersey No statute

BHIP Model and eacht supplies cut lite inter 66 page catalogue 25c Win Wild. 510 K 11 b N New York City

BOAT Models, P. T., Cabin Cruiser, Speedbest Free Circular Al, Star 2003 Lincula Ave. Chicago 14.

BRARS Gears and Model Supplies, send 10c for catalog Pierce Model Works, Tinley Park, Ill

MONEY WAKING OPPORTUNITIES

MECHANICALLY Inclined Men Ong and operate general Appliance Repair shop Complete translated to the shows you how Welding Retrigeration Mo or repair How to get bus ness etc. a liphases divered Proc. I tenature Chirace dupper Dept. 1456, 2035 N. Central Ave. Chiraco.

BE A Nove to Manufacturer make large profits No expens to equipment needed easily learned use garage or basement materials available, orders waiting Plantas Products, 127 Glement, San Prancisco 18 Calif

CLEUTRIC Circles are every witers and policy indiags, homes, parking lots, includes Reports int course Out cars to learn course with pictures and drawings team You how to report these rocks. Electrical Risply Co. Roc 2350-B. Houston I. Fessa.

OKT into good paring Post-war husiness now! Many opportunities open, new products—new methods. Investigate this opportunity at once! For detailed information write. Walkam A Shaw Dowe | 2 Maryand

A NEW Mail-Order business' Hothing like it' Make \$1000-\$3000 the first rest Complete Instructions only \$1.00 Copporton to ty Unitented, Box 2006-B Cieve and, Onlo

LEARN Metascience Remarkable drug see heating No stanignistion No appara ga Unbetwable simplicity and results. Incapensive correspondence course Write Mainec ence. De Land, Fiotide.

PRIZE Contest Page Can Win & Porlane' Fire abnouncement service Good news for untarented con earn's' Write today! National Contest Bulletin, Box 614-M Orand Central Station, New York City A \$100-A MONTH hobby at home! No so iciting, no mail order, no meeting people Easy enjoyable past me Details. 25c (Refundable) Laure Dickson, \$46-P8 Elisabeth St Anderson, \$ C

DON T send money Make money Free rateing of Otamite pushic merchandise hits and information Judge for yourself Glassite, \$21 N. Atlantic, Monterey Park, Calif.

PLANTIC Engineering para big Home a dy cootse Low root hast terms Free book et Obio Postif ale of Technology Box P 250 Oreen are Obio

Of ANT big ma . Hundreds of money making propositions home work offers in cluding any magazine a 1 for a dime Gardens de Publishers Cardenville 12 N Y

EARN moon at home! Thousands dol Home Worket Magazine te is how Sample. 25c. Stremore, Box 6, 4917 North Konner Chicago

WHOLESALE catalog, and directory He (Re andabe over 1 502 000 articles Stafford, Sunnyaide X. Indianapolis 44, 11d

PROSPERTTY Want Pinancial Security? We can help You Pres detain Unique of Enterprises Dept. 166 Pt. Neutavalle, Was-contain.

CARH IN 66 page book over 40 000 words.

The in each Monument in business secrets multicrier to a seasone A O Platter 5"2 W Ison St. Bullato H.Y.

BELL office supplies by mail Samples, groneymaking informs for for 25c refundable. Edgar W Thomas, Barnesville 11, Ohio

DETECTIVES Each Hig Money Experience an investory Partic sare free Wagoner. P 126 West 60th M Y N Y

CASH Mail Order Business Big Profits, Successf I Income Business Rollswood 28 Ca. section

\$10,000 000 PREE-Prise Contests. Wm. Portune. Bulietin, Pres. Cash Register, 210 Pilth Ave. New York

749 MONEYMAKING Opportupities, 25cl Pres bergala liate! Hirsch, Spring Valley 3, N. Y.

VITAMINS at cost Make your own. Supply others. Complete directions \$1.00 Practical Sciences Maineaburg I Pennsylvania.

PROFITS from Plastics complete formula 25c postpaid Gerald McNeely Bill Jackson Blvd Chicago 12, Ill.

PUT up powder and liquid fast repeating products under your name. Large profits Kirjan 366 W 65th Chicago 9

"QUARTERS Galore" by mail. Sample merchandise ad upt and place 25c Block Emporium 327 W Genesse. Buffalo 2, N Y

BIG Money in curtain laundry, For \$1.50.
I will teach you the tricks of the trade.
Mrs. Dotson, 1667 H St., Neps. Calif

WANT financial Independence? I've helped thousands Dr Trook 51A Phile 20. Pa.

ic SLOT Machines \$30 00 Force Feed Water Pumps 85 00. Flecks. Warren. Ohio

HALF nound big mail, 10c Thomsson, 607 E. Jessamins, Port Worth 3. Texas

PREE 7 day trias Amating Moneymaker Box 28M Jackson He ghts, N. Y.

MONUMENTS

WRITE Par Otreet Prices \$14.00 Cp. Preight Pold. Quarantsed Pres Catalog Gran to Ma bir Factory A49. Oppen Fla.

MOTION PICTURES & SOUND EQUIPMENT

OUARANTEED fresh movie film! Three spools double film \$1.45 film spools any-gle film for Univer nameras \$3.50 (Limit six spools each type; Processing feel Will ship COD on \$1.00 deposit fits touke of camera Zao 3, 4038 Broadway, Kansan City 2, Missouri

KODACHROME movies' Projection length sample from "Walkist Hula", \$1 00 from durb Try p overing beach while films in color with Irlacope K.t. \$5 00. Big subject entalog, 25c. World in Color, Box 392. Elmira, N. Y.

PEATURE sound programs—shipped anywhere \$4.95 complete. Free Catalog. National Cinema Service. Ti Dey St., New York

6-16mm SILENT-sound films, Complete rental abrary, All latest subjects, Prestata-uggs (sample film 10c) Garden Flam, 217 W Soth New York 19

"THE World's Greatest Passion Play".

2mm, 16mm, and 35mm. Specify Stient or

2mm, 16mm, and 16m

MOVIE Camera Plans. 100' 16mm \$2.50. 26' Double Sum \$1.25. Pres Developing. Better Films, 742 NewLots. Brooklys 1, N Y

RENT Buy Exchange 5 15mm gilent, award New money-saving plans Free de a 15 Mediand Pilm Exchange, Box 425.

WE can supply Morie falls in both 16mm and Double 86 write us for hinds and prices. Framader Graces Co., Davemport, I lowe

MOVIE projectors bought and sold. List 10c. United, 2300-D Lawrence, Teledo. Ohio.

DUY Seil Trade Jimm, 16mm Pilms, Prejectors, Equipment, Plata Pilms, Bank Bldg, Secaucus, New Jersey

8mm DESIRABLE Scarce others list 25c. Roward Suzkhart. 117 Rousevelt. Phile. 20. Penna.

LEARN movie projection, management Free catalog Theatre School, Kimira,

Nh.W or Used 6-18mm Silent-Sound Rime, Sale, Rental, Exchange, Pres lists, Circle Film Library, 12014 Prest, Detroit 27, Mich.

Benn 18mm Fil.MS for sale Lists Sc. Henta, Services-PS. Oukvide. Connecti-

BEAUTIPUL Kodachrome Slide and bat. 25c Art Sode Co., 8-1, Canton, Obia

FRESH Movie Camera Plims, Aminasagar, 479-A Quincy St., Brooklyn, N Y

SEND stamp for 18mm. Smm catalogue Sterling's, \$19 Northampton, Easton, Pa.

FREE, Year S.bacription offet, Amateur Movie News, 3021 Narragansett, Chicago.

57 MOTORCYCLES, BICYCLES 8 SUPPLIES

CLYMER'S Motoreyeang Manual Limited complete information, specifications, descript the dutent too oreyean Entrines transformations carbarrions, came, spring fractics had and forth sidenars, appear riding instructions. Contains two-tyle and power begins Motors was Bernies Manual Most popular & gust makes, teer riceally described it as rations mechanics features. Pos Daid & 50 America a most complete call and August Most popular and Charles and Cha

MUNICIPA Of Barancia in Motoracceters. Maget Cars Motor beken Motorepries etc Briggs Breatton Lausett Maying Motors some as his no 35 New Bules 4, Life ard Wheels at factors prices 102, 75 tire 52.75 order only bend 25c for new War Barancia alogie Number No.6, Just our case by Brat cans man's We have purchased the entire sinck of Shippa Midge a Modet Motors Directory, Athena Oc. 4

scort winds said on the most modern sport winds said on the market today All transporent plan it with highly primhed his proof frame You will be proud to own one Yim all makes and models Priced at \$12.56. See your dealer or send your remittance to us. Shipped Press d anywhere in U.S. Quick service. Your money refunded if not satisfied. Comiskey Engineering Co., 3203 Irving Park Road, Chicago 61 111

TIRES. Tubes. Wheels, for industrial trucks carts, wheelbarrows, scooters, midget cars, coaster wagons. Nationally known makes, drat-line quality Sizes S' to 14" o.d. in 2. 4, and 5 ply tires, separate unter tubes, heavy duty demountable wheels. Also Caster Forks, straight and 4" e. 'spes Pre-litairated circular and prices Javanit Cu. 535 h. harmange St Akron 5. Ohio

CLYMER & Motor Scraphook Handreds on a motorcy, as automobiles time at all described Annualog less nating story of Flood themer a superisences in motor business. Time Magnitus called it a "must," No. 1 and No. 2 entirely different, each \$1.50. Delians cloth bound edition each \$2.50. Comes 2125 W. Pice Louisian and \$2.50.

MODERN Motorcycle Mechanics," manca: ethicfred, revised second edition, she pages 300 i daira ions. The most upto date and complete motorcycle book publahed. Corres operation and servicing He ies Dat doon, Indian, and Bit ish mates. Attained immediately. Price \$3.00 Nicholson Brothers, Motorcycle Engineers, Sankatoon, Canada.

WHEELS. Tires, and Tubes for Motor Security Milest Cure Whee barrows and other Indust all equipment All area Also Biovas Parts and attended Largest miles in United States Send dime for list. Curse Transport Company and Michigan Ave. Dept. C. Chicago S. Hippota

PROPERBIONAL Midget Racer Motorscop et Midget Car and Midget Mourtyrle Prans sprifications for all four contained to a springed for all four springed used motors understudies Services es, etc. Instuded free! Midwest 1838 Orommand Toledo Otso

BOOK Speed How to Obtain It ' litusligated magnetions, came betance timing buries pie-one, facing technique World's greatest speed funing book \$1.50 pietoaid Comer 2:28 W Pics, Les Anseirs C. Cald

SUILD America's lowest priced motorscoper appetiter. Comple a plant aper Sentions, Big list used motors, etc. included free! Motor Supply, Box 1862-CE. Toledo, Obio.

MOTOR Books. Most complete sallomobile, motorcycle selection at America. Historical, technical, racing. Send dime for book tatalog. Clymer, 2125 W. Pico, Los Angeles 6. Calif.

PLANS? Scale drawings, specifications, illustrations for building extractive Motor Scotist complete \$2.00 plans electrically driven hicycle \$1.50 postunid. Carmer, 2125 W. Pico, Los Angeles & Calif.

MOTORBIKE Manual containing Motorbike, scooter plans. Catalog section and Motor tune-up Chart. \$1.00. Variety Enterprise Co., Box 124. Evansville, Ind

PARTS accessories pistons them Harley Da door Moto v ee McCanna, P.O. Box 114. E. Paso, Texas

V-8 60 KP Molarcycle—periem condition good subber—\$225 00. Pull details from Robert C Beard, R. D # 6. Lancaster Pa

MOTORCYCLE Parts, new and used List 10c. Ballak, \$11 N. 9th St., St., Louis 1, Mo.

MUSIC, MUSICAL INSTRUMENTS

PIAN'ATE Quick y improve technique
ago reading actuacy memorizing there
are through Mental Montain Coordination Free Booklet Broadwell Studios
Dept 953 Course California,

SONO Forms Wanted, for munical settings Bend poems for Pres Examination. Write for Free Instructive Socklet outlining Opportunities. United Music Corporation Satem 12, Indiana.

BONGS arranged and scored. Melodies composed for lyrice Workmanship guaranteed. Write for particulars. Tommy Kilbourne. Box 1253, Bakersfield, Calif POEMS Wanted I'll compose special muaic Send porm for Free examination. Sect Wright Box 3861-Y Portland, Oregue

'CROSS-note Puzzles". Interesting, instructive. Outding parents show child to music, music-writing Price \$1 00. D'Aleo, 165 W 45th St., N Y 19 N Y

MKLODY-Marmonization chord chart, together with simple staffless music shorthand, 41. P. Stackpole, 3113 W. Venange, Philadelphia 40, Penna

PLAY Swing Pianol Send let for instruction budetin. Christensen Studios, 766 Kimball Hall, Chicago 5, Ill.

POPULAR Plane in 12 lessons. Beginners or advanced gus anised Kelly School, 1734 30th Ave. San Francisco, Calif.

GUITARS Band Instruments Flought Sold Free List P & Ru-

NAME LISTS

NEGRO Names Women or men \$4 65-1,000.

Most any class names, Free Delasia.

Dixie, King N. Carolina.

PLOODS of opportunity Mail from everywhere. Write. Name Dealer, 624 Hicks Bidg , San Antonio. Texas.

OLD STAMPS WANTED

I WILL pay \$100.00 each for 1324 it green. Prantists, surpay it ary perturned stay-en (up to \$1.000 00 each unused). Hend \$6 today for arge I lust sted forder showing hithmany prince paid Version Baker, P\$-50, Elyria. Ohio

WHAT have you to offer? A collection? A Shoe Box's accumulation? Anything in stamps. We urgently need them, Spot cash paid. Cosmopolitan Stamp Co., 1457 Broadway (Times Square) New York

PATENT ATTORNEYS

ENVENTORS Learn new-without chingstime how to protect and only your invention. Write for free Record of Intention, form and complete instructions
for making disclosure and establishing date
of your invention. We also send our new
free Patent Guide for the Inventor containing complete information about patent
precedure and how to sell inventions givting illustrations of many successful intentions over 100 basic mechanical movemetric. We assure you prompt confider al
cervice. Delays may be dangerous Write
today fee your free "Patent Guide" and
Record of Inventon form Clarence A.
O Brien & Harvey Jacobson Registered
Pate I Altoropys, 122-3 Adams Building,
Washington, D. C.

PATENTE Secured Two variable booklets. Fatent Protection and When and Mow to Bell an Invention together with rainable Evidence of Invention" forment free Write mimediately to experienced paint counselets Vi. of J. Erana & Ca., by K. Merin Bidg. Washington D.C.

(NYENTORS Before discounty your invention o annone and for Form ' Evidence of Conteption Schedule of Clovarmhant and Afformey's Fees and instructions Sent free Lancasier Alwine & Rommel, Registered Palent Attorney 413 Bowen Building Washington 8, 13 C.

PATENTS—Trade marks. Preliminary advices book and disclosure form free. Personal per see fraing 1. M. Cathran 314 M. La Personal Bulg. Washington 1. D. C. Regis ered Paier. At liner.

PROTECT your invention through medium of my expert personal service, Prejiminary information without obligaton, Horace L Beall, 943 F Street, N W 4, Washington, D. C

INVENTOR S GUIDE" free, containing .00 mechanical movements, information about patenting, selling inventions. Frank S. Ledermann, 154 Nassau St., New York 7

C. A Brick & Co., S-471 Snow Bldg. Washington I. D. C. Registered Patent Attorneys, Established 1875, Literature Stated on request.

PATENT Protection. Write for information, Pres. Record of Invention. Pres. Randolph & Beavers, 168-A Columbian Bidg, Washington, D C

PATENTS Obtained, selling service, information, recording forms free, Labigar, World Building, New York 7

PATENT Particulars, free, airmailed Sterling Buck, P\$37 N Ave., Beltimore 17 Md

PATENTS FOR SALE

AUTO Direction Signal, Rotary Pontoon Salety Boat, Stooladder Shinestand Patented necessities, Sell, Let Royalty, Exch for Property Welsh, Inventor, Box 205 Ochund Calif

20 NEW-practica, inventions. Need reliable manufacturer, Snancing Soyalty. Write C. W. R., 2306B Dwight Way, Berkeley 4. Calif

POR Postway Manufacture. Patented Clamp and Jack for sais. Nothing just like it, C. Phil Stuart, Gorham. N. H.

43 PERSONAL

43

BE Lone's No More' Open Dealthy a Door's 50s Brings Cupid's Dealthy World's Greatest Social Publication, including on Honwide names, addresses either set Capitivating descriptions sparking pictures widows, widowers hachaiors, beautiful girls desiring early marriage (Year of monthly \$2.06.) Mention your age Dealthy League, Aberdoon 75. Wash

MRET New Prients through our Personal Bervice ded and to promot in of mer enting friends: ps District assistant comments, each entire to be absented that When its New York har as Crace Dowes April 2016 Her York Lity N. P.

ARR you a square peg in a round hole unhappy at home or in your work. For more than 15 years I have been helping hien and women 5 id themselves their taent possibilities, aptitudes and handicapa If you are discontented at home or at work send for. What About Your Puture which may give you a new teast on your future happiness and access. It is Free Dr. Bunker 2 Jopins. Mo

DRUNKENNESS Is a disease which responds to treatment Madical axill plus human sympathy prove successful with liquid and drug cases 66 years experience W a for free booker P S Nesson The Keeley Last, are Dwight Id

PSORAINIS & Gerera Has everyth on falled to bring even lembors at teach from scales lembors and totals. Then write today for Pice important information, You need a invest one cent! Pizacol Co., Depl. S. Box 3583. Cleveland. Only

CHESS Players, Play Cross-Country Chess by Mail. More Fun Than Over-The-Board Make New Friends Phrough This Nationwith Club Rapid Pitters Persons, Service, Information Free Mail Order Chess, 714 X 19 St. Merced, Canfornia

KATURE'S simple invigorating method for gaining weight relieving many aliments without use of Pills, Tonks or especial a Cooked foods instructive booket page 5%; as afaction guaranteed. C. O. Olsob. Grandy Minp.

MARE Colortus Handmade Jewesty with interfect by pastic links Popular g it liem. Excellent a sealine Free delata. Be ginner's kit and interactions. \$1 trefind able. Hughes, 718 Bides. Danieste 2 Lilinois.

LONELY? Plain scaled details free, Largest Club in West. Endorsed by ministers. Club Elite. Box 71, Los Angeles 53.

WIDOW and Widowers Club. (Confidentia) details 25c) Write John Rankin, Springfield, Missouri. MAKE Friends, banus joneliness, through this delightfully different, unique, correspondence circle. Sealed details free. Gotham Circle. P.O. Box 366. Times Square Station, New York 15. P. Y.

GET Acquainted (Tub -Through social correspondence thousands yearly meet their ideal. Write for not of eligibles Maniin jour State Plantson Boll (25) Denver Courado

LONELY People Everywhere are Ending real happy eas through introductions between Particulars and Previously I disk in you proof Nancy Jordan O.P.O. Box 176 PS. New York

MAKE new friends thru old restable c'uh
Free bonk with photos of members
Cu respondence confidential Exchange
Company 3827-PS Main Kansas Ci y Mo

ATHIETE'S POOT remedy Guaranteed Medically recommended \$1.00 but is pust-paid Dr. W. J. Reise D.S.C. Room J. Charanne Bidg. Lake Charles Louisiana.

LONELY 30th exclusive club Correspond with addes gentlemen seeking file idah p and marriage. Write Brusdway Priestah p persice. 472 Broadway New York City.

PIMPLES disappear oversight. I tries everything till I found this Pormula Make it rourself \$1.00. Morean. Box 341 Lowell. Mass

POSTCARDS—Trick your friends, 12 Postcards from Hollywood \$1.00. Return for remating—Bruce Huntley 1234 M Sycamore Ave., Hollywood 38. Calif.

HAIR Thurning! Unbestity Scalp? You Can Prevent This! It command Treating on Scalp Care \$. 00 Edward Mathieu Box 201A. Purcell. Obsehoma

F7ND Repoiness Through Astrology Ideal Mates Everywhere, Pres Details Tressa a Social Register, Box 16 Rasel Park, Michi-

HYPNOTISM. Complete 30 Method Course. 25c Western Institute Hypnotism D-1519. Palating, Ill.

REJUVENATION of Men. Also Disbetes without specie. Home treatments Healthhotel, South Whitley, Ind

BABRECT Merrous' Pears' Free encouraging information John England. Fromwood Michigan

LONELY' Confidential Particulars for America's Pastest Growing Club Bistr's. 4820 Sheridan 40. Chirago

LONENCME! Get "Cupid a Maj): Many wealthy (Stamp) Exce), 2149 Jackson, Chicago 12 Ili

COARETTE-stained Sugers? Use Tet-Tut Crystain, Excellent, Send 10c Drug Dept Son 28. Jackson Heights M V

DNELY? Trailered friend awaits you, particulars, Box 2027, Madison, Wisconson.

HAVE Per pais worldover 18 ustrated Magazine with list 10c World Card Carls King 16 Carolina

CONKLY Have romance, companionality thru corresponde on Particulars fire Pearl Smith Box 5-12 Kansas Ct 5-12 Mo-

LONESOME! Descriptions and details from Hig lists ACME Box 191 8 Alpha Ottober

"CARRIELLE 3 2" gut \$1 00 not Glamour George Wilson, 4024 Girard, Philadelphia 4. Penna.

PROBLEM12 ED* Your problem 1; ly and lysed advised \$2.00. Schoenberg 16 Carrington, Providence, Mhode Island

AMAZING Discovery of the Biblical Garden of Eden. Detailed information \$1.60 The Better Way, Box 456 Lakeport, Calif.

LONESCHE? Oct acquainted this masy way Confidential scaled particulary 25c coin Box 310. Memphia, Tenn

YOU'R Letter Mailed In Any U S. City \$1 Personal Service Bureaux, 432 Boslyn Place Chicago 14. HAIR Failing! Dandruff? Write Trichologist, 130 Lewis Street, Phillipsbury N. J.

COMMONWEALTH of large. Literature 15c Bux 67 Station H, New York 25

LONKLY? Let Birds of A Feather help you. 6. Dickinson, Box 142. Bangor, Maine

BUY Vitamina direct. Save Postcard, Matoska Products White Sear Lake, Minn

LONELY' Stamp For Particulars, Prancis

BANISH Loneliness, Particulars From Occar Mayes, Box 387, Elmira, New York.

H PHOTO PINISHING

EERSTATIONAL introductory offer! Send snapshot or negative, this ad, and le. We it send you a beautiful T x 5" enlargement! Or, Kodak roll developed w h 18 successived deckied edge value independ prints or 3 double-size prints. 25c' Special! From your pegatives if regular-size or 8 double-size reptim s 25c Candid Rolls 36 exp John developed vaporated enlarged to Ja4 51 80' 18 exp. 50c Reprints, Ja4, Jo each. We have new, perfect 35mm film. Low prices. Free Maller, details on request American Studios. Dept. 260, La-Ciusse, W.B.

BIGORET \$1.00 value in 35mm finishing today 36 exposure fine grain 3141415 entergements; deckied, emboused margin and fate. Eighteen exposure 150, 16 exposure spits 55c, 16 exposure reloads 56c. Special return this ad with \$2.00 and we will send five 36 exposure reloads. Free Mariers, 8 exposure rolls in beautiful, deckied contact fluish with embossed wide margin, 25c, Maribag Film Service, Box 5445A, Chicago Sc

BEAUTIFUL double sim Pictures 31% coach, from 115 and 136 argatives, 34% of from all other sizes, All work guaranteed. Overnight service. Bob developed and 8 pictures 30c. Roll 13 pictures 46c. Roll 15 pictures 46c. Enlargements on double weight portrait paper 3x7—36c, 8x18—50c. Copies made from any picture 75c, Pacific Photo Service, Box 686. San Francisco, California.

CHOICE Film Offers Rull developed & Genuicity) enlarged prious derived f desired), or 16 brilliant. Lifetime prints or 5 speckling or 1 a plus 2 fade proof enlargements. Fro war quality and price as: Fis service Q ally guaranteed F as malers Dept. 18 May Studius, La Crosse Wisconsin.

SATINFACTION or your money back 2 regular side primits from each good nere-live on a exposure rol complete 25 tents or 5 jumbo size prints complete 36c The Old Miliable Foncet Photo Company Box 123 FS W. A. a Kanass

OIL charing photographs can be a fact no ing hobby or profitable adente for those with at intertained Learn at home large simpled the rod for free booklet. Na ional, I ho o Cololing School 1315 Michigan. Dept. 1722 Chicago 5, Lie

ROLL Developed and 8 beautiful enlarge acrits 3 to 6 times larger Deckled Edgs - High Clicas Any 2 exposula rott 25c com. 12 ex. 35c 16 ex. 80c—36 ex. \$1.00. Reprint Enlargements Ic each Alden Photos. 94 4 Astor Eta 10n Baston 21 Mass.

MONEY Back Guarantee-14 Sparking double clear Nu-Art Prints, also 2 E. ame) Firms Energements Al complete 25 cm. a Rolls or negatives. Prompt, Careful, Guaranteed. Lifetone Studies. Dept. 36, Dec. Moines S. Jowa.

TOUR 6-8 Exposure Roll Developed and Two prints each good negative Juc Or enlarged to about Plot Card size 8 Exposures 15c 12 Exposures 40c 16 Exposures 50c. Hapid Poto Service G P O Box 613. New York 1 N Y

EVERY picture an enlargement! 8 sparkling deckle-edge Enlargements and zoil developed 25c cuin, 114 size or smaller, er avge reprints 3c. Enlarge Photo, Box 79.Q. Boston, Mana.

AT Last! Roll Developed, all your enapshore hand colored as been full as must artiful colored plic scrapby 35c Hand trabred reprin a to each 13 for the Marional Photo Art Co Janesville 21 Was

2 BFAUTIPUL E: Close prints each good negative and en arging coupling is the each to a management of developed Sic Outphoto Co Weatherford, Ohishoton

PHOTOSTAMPS, picture yourself on postage stamps 1520 each. Free Samples. Arr tatt Photo Co., 1660 Convy-Island Ave., Brucklyn 10 N Y

GLOSSY Prints with your 5 or 8 exposure
Ross 40c Reprints 40—Prompt Service
Photo Art Lab, 840 S. Thustas Court.
Newport News, Virginia

BEAUTIPTL Lifetike Statuette made from Your negative \$100. Copies from pictures proofs etc. TSc; 25 enlargements, \$100 Modern Biudios, LaCrosse, Wis.

SPECIAL. Coupon for six \$x7 entergements with roll developed and printed, up to 16 prints only 25c reprints 3c Dick's Photo, Louisville, My

Studio, 1606-S Bond, Rockford, Illinous

REPRINTS le each any number minimum order 350 Fred A Eastman Bode Jowa.

WW PEASTIES

PLASTIC Beginners Attention Attractive hit. Plastic sand paper die all d'alue Also work sheet a vind complete operat inst for maiting horelises easy a mple in frurlive \$1.85 Prepa d Bend Money Ordet Plastic Dies, Station D. P.O. Box 141. Lan Angelea 7 Ca. d.

PLASTIC Craft Kils-includes Lucita dies cement, instruction book Work sheet. Makes several projects. Complete 43 00 Plastic Products Co. Box 184. Massilion. Otio

PLASTICE in a Nutsher? Complete outline, Includes instructions for starting profitable plastics (abricating bus ness \$1.00 Plastics Information, Bus 613, Stamford, Conn

LUCITE Cetarin Lumerath Funiglas, 2 he package assortment \$2.00 Homecrafters, 15 & skine Ave., Toronto, Canada

PLASTICS without high best or equipment, cheapt Formulas, instructions. 11 00 Tirekop M 1 Made as Otto

POLLTRY & SUPPLIES

RAISE turkeys the new way write for from information expendings how to make up to \$1000.00 in your own backyard address Hattorn's Turkey Institute. Dept. \$1 Columbus Especa

PRINTING, MULTIGRAPHING, MINEGERAPHING, ETC.

QUALITY Printing I rolor 1000 each Bond Letterheads, S atemests 86 to 5 to Envelopes 64 50, No. 10 85 75 Pre pe d Retr. ance with order Oct LaDreau (C), 1222 , E Second Duluth 8, Mann

\$3.00 POSTPAID 150 Statil Occul Bond Letter) ends and 150 Sta Envelopes 500 of each \$5.75 postpaid Mero Products, Bon 244 Purasstawney Petros

MIGRADE Letterheads \$\frac{1}{2}\text{sid} \text{506-82 86,} \\
1000-46.50. Postpaid, 16\text{G} Higher West of Mississippi. Wilham Jones. Westbory Ave., Mineola, New York

156 61, v is LETTERHEADS and 156 61, envelopes 57 00 prepaid Going, Box 8-1544 Muskogee, Okiahoma

QUALITY Printing At Lowest Cost, Samples, pricelist, free, Adams-P, 30 W Washington, Chicago 2.

2.000 PRINTED letterheads, 28 00. Envelopes 36 25. Psychical Publishers, Remington, Indiana

PREE-Your Personal Stationery, Write C Morgan, 1310's Third, Corpus Christi.

400 5 15 XE 1 LET LERHEADS \$1 25. Samples Pres. Mango. 3658 S. 20th, Newark 3,

CARTOONING, Shetching, Drawing Lettering 46 Letsors 700 i astrations 8. % William R. sardson Wissing Pa

SIXTEEN quality pencils with your name imprinted \$1.00 postpaid Little Press. 5015 Thomas South, Minneapolis Minn.

SUPPLIES

PRINT your own Postal Carde, paper, or anything on Prin ome in Self freding Rolary Postal Card Stencil Duplinator Only \$5.50 with \$2.25 worth of supplies, attricts link eff. Liters are Prec. Philaburgh Typewiter Supply 336-RA Posith A c. P. Laburgh 22, Pa.

PRINTING equipment, type and supplies. Send stamp for details or dime for complete illustrated supply book. Release Inc. X. S. Meriden, Conn.

1NEXPENSIVE home-made printing press. Details free. Noverty Shop, Downsville, Louisium

FRINT At Home—Send 10c for Catalogue
Type, France, Supplies, Barnhard Co.,
4 Columbia St., Newark S. N. J.

HOME Made Printing Press, Duputator Printers Culti-details 10s, Tirekop, M-9, Medera Otto

PRINTING Presses. Type Supplies Lists ic Turnbough Bervice Lossinia Pa.

PRESSES Type Cutters Supplies, Bulle-

OF PROFITABLE OCCUPATIONS

NOW To Start Your Own Bustness —
shows how east y you can be your swe
bose sould security for yourself and your
family, grow su er and wealther your by
your Expert easy to follow advice on how
to choose a good location how to display
merchand so how to figure markups cost
of sales gross margin grow with records
to keep how to advertise effect vely, how
to start on a money making basis. Tested
fules for success based on years of act as,
experience in operating small businesses
profit abits. Only \$2.2 ft Davis Dept. Pag.
Empire State Bidg. New York 1, N. Y.

ANNOUNCING home study course in commerc a baking Practical bear training Good held for those with aprilude Nearly depress in proof field for free broket Opportunges in the Baking Industry " National Buking School, 1915 Michigan Ave. Dept. 172 A. Chicago 5, 121

LOCKSMITHING Profitable Business or Hobby New course teaches you how to pick locks, it here de code masseries etc Ever self instruction seasons Bargain price Pres details, Write - Nelson Company Dept, 7-01, Chicago 4.

Seed contract supplied Particulars 10c. Associated Grewers, Dept. 13. St. Rachert, Man-john

HOMEWORKERS, make sell shell noveltum. Beginners samples instruction \$1.00 Burton Box 27, Station A, St Petersburg Pla

EXCEPTIONAL profits raising mink Pinest breading afork aunitable Details furnished Pranker Young Riverhead Long is and New York

546 00 WEEKLY Made growing mushcome. Fresh Dried Dominion Patent IJ 563 free spawn North American, 160 Y Totale Toronto Canada

DOUBLE roug money back if not delighted with description new man order profits' Rush the MacCormach, SE Madeirs, Otue

MUSHROOMS Grown Boxes, Berryk Instructions 50c Spawn \$1.00. Gordon, 583 William, Winnipes, Manitoba.

CASTING Plastic and instructions \$1.00 Instructions 50c. Alvin, 553 William, Wannipeg. Manitoba.

26 RADIO, SUPPLIES & INSTRUCTIONS

CRYSTAL Radio Experimenters Proc catalog Sensitive clipitals Code Condensers. Diagrams Haset, 29 K 20th, New York. RADIO and Mardware Elt-for repairing and experimenting contains color sockets condensers runs are, photostate etc. boll socrems gate washers tivets, spacers, springs, atude, springs contain lags brackers, are as bakel to fiber asbestia, rubber, etc. \$2.00 per h.t. Seni. C.O.D. Radioco, 11108 Marshall Bidg., Cleveland, Ohio.

TOUR New Pres Catalog Is Ready! Rad unic's Catalog lists hard-to-get radio parts and broks All available for Immedtate shipment. Send today to Radionic Equipment Co., Dept. SC; 176 Nassau St., New York 7, N. Y.

POXHOLE Statio Amazing servicemen a pastime gift, batteryless, tubeless, schoolboy thrill, made anywhere, anybody Easy distance-getting instructions. 5. 00. Oxdgets, Box 25, Dept. 507, Jackson Enghts, N. Y.

2500 RaDiO Tube Substitutions with change over data in handy form, 176 pages of valuable information Send 63 00 for prepald cupy Radio Equipment On 1415 W Franklin Ave Minneapolis 6, Minn

BUILD Latest, Extra-Loud Crystal Set, Instructions, 20c. Booklet, 'All About Crystal Sets,' 45c. Exceedingly Loud Crystals Available, Amorose, Rt. 4, Hungary Road Richmond, Virginia.

MAKE Simple, tubeless, batteryiess, dislance-getting crystal radios, crystal and litustrated instructions. Sic postpaid. Allen. S-437 Clinton Missouri

RADIO Service men and appeamenters send stamp for our giant radio catalogue, Save dollars, United Radio Co., (1906-V) Newark 1 H J

5300 miles) incl. d. og Radiobut-der' 25c Labora'oride 2626-T 18th Ave., 66n Francisco 16. Casti

RADIO-Vacuum Cleener Parts, Tubes, Neon Circuit Tester 50c, Discounts on Quantity Orders, World Raies, Box 21, Clifton N J

MEADPHONES, new lightweight sensitive 2000 chms, complete with head band and cord—\$2.25 postpaid Van Sickle Radie Supply Co., Indianapolis 8, Indiana.

BUILD radio complets with tubes \$10.56, details, Radio, \$4.50 Ave. A, Brooklyn, N. Y.

BEGINNER S Radio Repair Bookiet, Mail 25c. "Radio", Non 211-E, Benton Harbor, Mich.

LOWEST Prices. Radio Tubes, parts. Bargain lists 3c. Potter, 1314 McGes, Kansan City 6 Missouth

PAMOUS Rasor Bude Radio! Illustrated Plans 35c. New Radio, Lobridio, Iowa.

RAZOR BLADES

SAPETY Renor Users We have just what, you need, let us prove it write us. Smoothwage Migr Co. 1824 Broadway, Toledo Onio

A BUBBER STAMPS

SELP-INKING Pocket Stamps—3 lines \$1.00; 3 lines \$1.25; Dater 50c, Postpaid, Circular free. Press, Warm Springs 1, Georgia

SERVICEMEN'S Mit contains stamp, jult Pad, Indelible Jult \$1.20 Escello, Box 500, Shreveport, Louistana

PROMPT Service custioned indexed, 1 line 25c, 3-35c, 3-50c Guaranteed, Stamp-craft, 1707 Virginia, Gary, Ind.

BONDWRITERS

27

solid Writer's Attention! The amazing demand for phonog aph records acceserated by more than Jos. 300 Julie Boxes and the Bits accessived them warrants rour immediate consideration. We are offering sorg poem writers the rare opportunity of having extablished component collaborate in appealing material received this month Recola Becords. But \$678, Hallywood 28, Calif.

POEMS Wanted To be set to music Send your song poem today for free examination by our staff headed by nat many famous hit computer of Dream A Little Dream of Me. Our new 8 step plan is must liberal and complete ever offered Write today for free book of Screenland Recorders, Dept. PS. Ho., wood 28. Calif.

SONGWRITERS Collaborate with matietrsity famous componer of Boots and Baddies. Send poems for free examination. Get Free instructive bookset. Ho, 1 wood Harmony House 126 B Ls Sten, Studio L-7, Los Angeles, Caufornia.

SONGWRITERS Songs Published Monthly Against Roys to Send tour soles or sooms today for our strong offer Prop book on songwriting No. wood Taleem the Dept 16-P-C. 1824 Mairon Ave., Moldwood. Cabi

THE Complete Songwriter A new home at ody course of the fundon words mustice and arrangement Simple, practical to page book \$2.00 postpaid. M.O. Puritan Publishing Oo. Dept APS 143 & Dearborn Ut., Chicago 4. Lil.

BONG Poems Wanted, for mastre) settings Brod poems for Pres Examics ion Write for Pres Instruct vs Booklet on caing Opportunities. Unjed Music Corporation, Baletti 10 Indusca

FEW songs and lyrics wanted for popular radio program and professions) promotion. Pres examination. Transradio Music It of Department P 8 1830 Mesadeny New York (affiliate of B M 1)

porting Write soday form ferrice, 331 3
West alth New York

BONG writers Melodies applied without charge by recognized Ho swand rompowers lend then a and records for taked Chiema Hong Company Box 8-27 Beverly H. & Canto n.s.

POEMS Wanted to be set to music Pres examination. Send poems, McMe.l, Master of Music, \$10-PS \$, Alexandria, Les Angeles Ca forma

SONOWRITERS—Send Poem For Immediate Examination and Free Rhymine Dictionary Richard Brothers. 65 Woods Building Chicago

SONOWRITERS—Send Poems for immediate examination and Free Book, "Your Puture in Songwrit ne" Radio City Music Academy 1676 Broadway, New York 19

POEMS Wanted for Musical Setting Send poem for immediate consideration. Pive Star Music Musters, 965 Beacon Suijsing, Boston

WANTED! Lyrics, melodies for songs, We arrange, publish, sell, Superior Song Studios, Passaic, N. J.

Write for details Put tan Publishing Co. 343 B Dearborn St. Chicago 6, Hunous

YOUR Lyries Melody or Idea made into complete professional song - 83 00. Shell, 22.7 From Bt. Marrisburg Pa.

MUSIC composed music printed—since 1910. Reginald Belcher, BloomHeld, New Jersey.

Proc Mid West Music Press, 4737 Stondway Chicago 40

OUTSTANDING service for songwriters. Hibbeler C13. 3157 N Avers, Chicago.

28 SPORTING GOODS, GUNS. PINNING TACKLE, ARCHERY

LIFE Buits & Rubber Boats (Dual Life Preserver Me'ts 'Seconds Ideal for Sportamen Uses Spa h at Car'r dgas ar Inflate by mouth W, hout Cartridges, east 12 to Used 8 to May West La'e Vests, need repairable W h repair h t \$3 to New \$14 to Compatible pubber boats Write for circular, Karl Oct. Dept. PS-2, Tork.

BRAND New Owns available for immediate delivery in trade for your used Rules. Shotguns. Handgans, Rees. Rods. Out-bailds, Cameras and other sports equipment. Have money by dealing with America a Biggant Traders who offer max mum Trade A lewances for your merchanduse as full or part payment for new guns. Ship your merchanduse for appraisal or write full description today. We also my Spot Cash for equipment Send Se crefunded with first orders for Fall Guaranteed Bargain Calaing testuring new and used guis and other Hard To-Find Herna Risin's Sporting Goods. Shirt yours Past Trading). 3067. J. Haisted Chinago T.

WANTED—Any make, side, any or condition, outboard motors, having tacker hip boots, waders, biocculars, guns, smmun,tion let a trape or any other ou door sports equipment. No foolin, write your own paice Outdoor Directory, Not 701, Marion, Indiana.

BOWS Arrows for Macrostics Hunting-Fishing Mesetiful Archery instruction book 70 pages, 50 plusinations only 50s. In untrained calmingue Press A chery Selec-Service, 517 Moute State Chicago

ORED Ouns Busculars bought, traded, so d Ammunition bought Mighest Cash Price Paid Blooger Arms Corp., 507 Pifth Ave. New York, N. Y.

THOUSAND Bargains, firearms, binorulars was relies catalog los Smith Mustuth, Runnemede H J

19 BANS Plies 21 00 Pres Ply Lat Prank Hudson, Bull 1162, St. Petersburg.

AMMUNITION Available to Qualified Purchasers List 160 P. S. Rosenska s. Atchieses, Kana.

MEND like for list 100 used guns, Pray-

USED guns, bought, said, exchanged, List stamp, Howe, Coopers Mills, Meine.

STAMP COLLECTING

Fing Beries for twelve over an Nationale he most unique remarkable impressive and brautifu, set of sumpe ever to seed it fairly cries for a specia, astrony worthy of it such as we have published it a very fine album of 14 pages. Cover designed by a famous artist Arrangement artis is and practical testing the history of each homored is also it is Pres to sincere approval applicants. Just send for for banking expenses and six a who her you deare approval applicants. Just send fit are or foreign stances or foreign stances or both Approval Headquarters. Choise Stamp Co., 268 Fourth Are New York City 10, Dept. 217.

PREE Ino Jima New U & Dramatic First Day Cover with 526 Different and advise Aus ratio Contenary Jubiles Telephone Procure Grant Distriction Counter Cuts Cuts plus Fire Complete Charles Catchonovalia Anthem District Free Prench Ecuador Guides Gate Raun on DeGaule Soviet Complete Bordes Spen Coumbus Air Uriguar Artist Walls Fature New Insue of the long Poreign Approvals only \$1.00 intercity Co., Dept. Y Port Washington.

PETIRABLE New Palitiand Island Dependency Stemp MacA thur etamp from Ameralia. Abjustician Wad Stephant issue, plus hoat of others from New Catedonia. Indo-China. Rusta. Cuba. Wa a de Fatura Dutch Indies. China Phis ppines, etc. only be to approval applicants. But Dime Packet Livit free Methaca Stamp Service. Inc., Dept. 46. Lawrence, Mass.

PREE Pick 25c worth of stamps from our first L S Approval Selection Acprox.ma sly 100 stamps to choose from Eace lent value. No obtantion to buy lasts illustrating the most pypular US stamps at paires you can afford—will be introded Don't Miss this opportunity! Write today S D Engst Co., 32 Park Row, New York City

Dime' 500 United States—Abenitiely unpicked and unserted—just as eventwed from thurch missions. Many varieties, including large commemoratives airmails, high desommations up to 55 001 Stampdom a biggest package of fun—and you might find something resity variable. Price only 10s to arrives approval service applicants. Mores back if not despited I univaled bargain him with each order. Mystic Stamp Company Department 56. Camden, New York

WOW' \$10.00 Worth of Pus-Only 18st 500 foreign statum, insorted and unpacked, just as received from church missions other sources Africa, So America, Australia China, Philippines Dutch Indies, and other coun'ries Includes few commenturatives, airmails, and stamps catalogung up to 25c or more each Biggest value in stampdom-and you might find comething really valuable? Price only the is serious approval approvate Money back if not despried Jamestown Stamp Co., Dept. 5 Jamestown, New York.

POSITIVELY Orsaires Pres Offer—Latest Scott's apternational \$6.00 Stamp A burn-covering entire World, contains \$6,000 illustrated, descriptive spaces, Scott's 1945 Standard \$5.00 Catalogues. Philately's Encyclopedia -absolutely Pres to applicable for Possign Appearals becoming restorers. Sarguin Stamp Service Palm Springs. Campenia.

PREET The Stamp Finder! Bend loday for buy new edition fully himplested, enable if you trained by to identify my difficult enamps. Also has packet a runge factuating stamps from Bosess Herzegovina Monaco Pausia Lyprus etc. shroding maps, ships an diale at difficing services. All free to approval approvants in costing to pue aga. Garreson Bran p.C.a. Houris Carasa Maine.

EXCITIC Pictorial Collection Tabili Spearfishing Memoratan Iout -Ca. b Arrher-Columbs Ha box Remove Piptuce Jugoslavia Philippines Porto Rico Malagasian Parinet - Duick Indies South Africa Roman's Charity - Martinique Bettlement - Newfound and Codfish - D. bouti Locutant is Victoria Everything only Sc. Imperial Stamp Co. Yorkers I. N. Y.

PRFBI Leeburd In Cayman is Turks and Caicos plus 60 d flerent mint Goe, Ti Curona on poster stamps, to approval service applicants sending is postage Tatham Stampen, Springfield 56, Mass.

VICTORY Packet Free Includes stamps from Tanganrika—British Carman Islanda Anima. — Scar e Babibead Co onation - Early V tortan Armail Map Bramps—with Big Caralogue a line send be for purage Grav Stamp Company Dept PR. Tolonte. Canada

PREF dologron talanda 'Ouadairanal'
Beauty: Caribbean Triangle Secretal
Mukden Carchoslovakian Lidependence
Zoo stamp: Siberia; French Br ish Colonies, others—all Free With approvals. Postage 3c. Bennett, 1985 E. Gosan, Long Beach
Z Calif.

OPPORTURITY Gorgeous lot with Tviangles Diamonds Glants Midgets Plags. Airms in and Railroad Stamps Also Guiaria D; bouth Mongolia Angels, New Caladoria etc Everything only 100 to approval applicants Evden 2, 248 Woodland Dr., Kenmore N. Y.

WORLD & Largest Diamond And Triangle Stamps. Free Stamp Magazine, Humps from Pighting Pres Prench 36 stamps from 36 different Countries Picturials Arrmans Sig Bargain Sc With approvals Capital Stamps. Dept 18. Little Rock Ark

UNITED STATES Collection. Prity different mint commemoratives, very fine, unhinged condition from 1925-1939. Price 22 06 with request for United States Approvals. Fort Orange Stamps, Albany 1, New York.

FREE wallet. If you buy Me worth of stamps from our coloriul approvate we give you free an at ract to two-toned stamp wallet Holds Th stamps Just the thing for your duplicates. Alpine Co., Box 536 New Rochelle N Y

EUPER Special-Choice African Packet 50 all Different A Galax) of Scenes Bhowing Lions Tigers, Native Chiefs and Jungle V lages All for 10c to serious Approval apparants Detroit Postage Stamp Co Detroit 21 Mich

SMOKY Mountain commemorative sheet largest U & stamp issued, and 33 U & including commemoratives, airmail revenues, etc. Catalogs 75c—To approval appilrants for 60, Ourhan Stamp Company, Dept C. Gloucester Mass.

PREMIUMS and premiums-but the Point-Bystem premiums are worthwhile: Eibe albums and stockbooks, world atlases. stamps etc. Send for Point-System foreign approvals and premium plan. Charles Horn. Santa Ana. Calif

GOYA Nude 3c and postage with request for selection of moderately priced mint. lectors only No penny Itema-references requested. Forest C. Wilson, 711 North & St . Tampa S. Florida

ang Zeppelin Trangles, Latin America etc 5c with apprevale Continental Stamp Co. Box 605, Dept. C. New Rochelle, New York SPECIAL Airmaile-19 different, includ-

116 DIFFERENT stamps including com-memoraures, charities airmai, sets etc. Only 3c to approve Buyers. We buy collec-tions. Bedger Stamp Co., Miswaukse 3. WINCORNIN.

BCARCE 1880 U & Hussey Local Carrier Stamp listed at 13c Asso Contactes No 85 listed at 40c Both sent free to approval buyers sending 3c postage Pindon Stamps, 1717 B Idahe Teledo 5 Ohio.

PINE Approvals, freship mounted. Past personal service. Tell sie what countries you prefer and I it send their stemps. Miton Skinner, 345 East Ocean, Long Beach 3 Cauf

116 DIFFERENT stamps from for away courteres including Atomad and Pres Pignting Franch to approva, applicants for 10c Reich Stamp Co., 4647 Kenzore, Chi-cago 40 Dept. 89

PREE 150 Stamps—Giant, Triangle, Dia-mond Shapes Included, To Serious Ap-prova, Applical a Send 50 Postage Hap-ding Regent Stamp, 130 Philipsah Ave Brooklyn IT N Y

BERIA Indo-China Dansig Egypt Lebanon Syria China Brilliah Colonies. Triangles, Airmans E'c Big Packet, only Sc with approvals, Glendale Stamp Co 2313-O Hermonita, Glendale 1. Calif

19th CENTURY U S. Commem, Civil War-Battlechip revenues, \$5 and \$16 Stamps free to U.S. approval applicants. Metro-politan Stamps, 188 O. Hrondway, New York.

EXOTIC Pitesien Islandal Beauteous French Colonies, Corgeous Tongs Everything 3c with approvals! Extra! Extra! First 200 additional gift. Same Co-Valley Stream, N. Y.

FREE Camadian Sets, Royal Visit George VI, George V. Coronation, Jubilee others, to approval applicants, Ensign Box ers, to approval applical

BRITISH Empire! 16 Different including Balum, Burms Cyprus, Owaliar Tas-menia Se to Approval Buyers Lyman, 93 Names St. New York ?

COMPLETS United Status catalog with 1900 (thatrations) Send 10r for maying Harrie & Co., 10 Transit Side Boston. Mass

UNITED STATES approvals complete corerage fine quality affractive prices. Seminole Stamps. Box 436. Cocsnut Grove. Florids.

FREE, 30 Different including Cossack Diamond, 's stamp Triangle Gobs others Approvak included Send 3c postage Fil grim. Waverly 18. Raitimore, Md.

FLASH! Super Value! Djibouti Bethuanafand. Cameroons Dominica. others all 60. Approval Applicants only 800, hwest 81 amp Co 805 117, Long Beach 1 Cauf

6. and Poreign Departmet ta. Pleuses the Particular Buyer Return Postane Paid, Atwater, P. Q. Box 1523, Miami 35,

EXCHANGE Your Duplicates, With Col-iectors Everywhere, Stamp brings Pat-ticulars, Kurtz, Box 1051, Allentown, Pennsylvania

COLLECT And Seilt Fine Worldwide samps on approval. Liberal confidential discount. One reference required. Harrison, Box 266. New Orleans 9, La.

EUROPEAN South And Central American Approvals, Arranged By Country, Henry Zimmer, 322 Culver Road, Rochester S.

12 ULFFERENT Persia Je to approval applicants. Premiums with purchases Brandwein Stamp Co., 167 W 33 Bt., Ba onnie 21. J

PREE 25 different unused foreign stamps to approval applicants sending Jc post-age Universal Stampeo 1716 & Park Row Bldg New York 7 N Y

erom some more You it ear that too after you receive our super approvals. R. P. Russell, 1312 E. Montgomery Johnstown, New York.

DEALER & Wholesale Catalog. Postage Ic. Franksco, 5031 Queriaberry Baltimore, Maryanid

POUND Beg unpicked stamp milliure con-taining thousands \$1.00 Languere Shup. 100-C West 42nd, New York City

M DIPPERENT United States &c Approvate Dischip, 1143D N Keeler Chi-

66 DIFFERENT United States Sc with Approvals Bookman Box 145 F Maplewood N J

UNITED STATES Canada Newfoundland Approvais Recent British Colony Sets Dan Hayden Box 703 Boomington Lit

PREE''! British Empire Packet. Postage 3c Williams. 601 Archerbidg, Bayerty. Mich.

PREE! Fony Express set (facsimiles)
Postage 3c Roberts. 401 Shearerbide. Bayerty Mich

PREE! Western Hemisphere Parket Postage 3c Owens, 801 Weighbidg Bayesty

see MEXICO with airmails and large commemoratives \$1.00, 1000 \$1.05 Beshi Apdo 3847 Metico City

SCARCE Landy Island 25e approvals. L. Arrington, 147 Hunter, Scotch Plains. New Jersey

SENSATIONAL Stamp Cuntest Prises to. ued \$1 00 or over to all contestants. Gerhart 2806 Rio-grands, Austin Texas

UNITED STATES. 34 45. and \$10 stamps and packet only 3c to approval applicants. 8. Wineholt, Woodbine. Penns.

PRESHLT mounted approvals for collectors using Scotts International Junior Album Wisschim, 55 Nazie Ave., New York 34.

FIFTY Canadian. Newfoundland, including earlies, commemoratives 10c approvals, Heade, 606 Gerrard, Toronto.

25 DIFFERENT Guaternals 10c with \$4-15le Approvals Cartoll's, 4357 C & Hoover, Los Angeles 37 California

SPAIN Five large struntly Send loc. Approvals. Buchanan, 247 E. 23rd, New York LO

PREE' Approval applicants select 10c worth Pree-Your choice. Excel Stamp Berrice, Box 1315, Chicago 90

ADULTS Approvate outstanding stamps of United States and Foreigns, Discounts, Frank Carr Jr Pompton Lakes,

CHINA Burma India 46 Stamps includ-ing Pirtorials and Approvals Sets-Studies Shook Box 128, Rocces et Penis.

APPROVALS for addits Unusual values, its them H Frenk Haher Kass Belauket,

FIFTY British Colonies Free to Approval Applican s Felican Stampen, 1600 E. W 1th St Miam, Fiotida Eth Br

RECELLENT Pictorial approvals. Reason-ably priced. Grown Stamp Company, Box 331, Toronto, Canade

TRIANGLES (Mozembique Co.) other beauties, 10c Approvals, Reuter, 411-D W 40-h Los Angeles 37

DIFFERENT and unusual foreign approv-nis, Kirklands, 7212 Farwell, Chicago

AMAZING Value: Pifty Different Pictorials Oak St. San Francisco 2, Calif

AMAZING Lot, includes diamonds, tri-angles, 100 with approvais, Deluze Stamps Box 4137 Los Angeles M. Caul

FREE France Packet be with approvals, V T. Walton, Porter Rd., Nashville 6, Tenn.

16 U S. CIVIL War Itsum Sc. Approvals, Graffam 266 Secton Medford 56 Massa-

Shop, 2 6. Madaon, Greencastie, Indias A

COLORPUL Interesting Approvale to Business-like rolectors See what you Buy Johns, Box 2013. Detroit 31, Michigan.

NEW Zenland triangle set complete & cents with approvals. Logar, 1985 N. Paucita Chicago 22 1n

to BCARCE Phi ippines \$1.00 U S. 150 Co Shocksway N J

SPECTACULAR Approval service for collectors using International Junior album, Loswy, Aberdeen, Maryland

FREE! Sensationally interesting moneysaving scamp magazine Phuatelists. Ab-

ale right price real pice Jarr. F O 111. Denver Culorado

BEGINNERS Pictorial Approvam-Premiums? Surely Suburban Stamp Bales, 1234 Grant Drive. St. Louis 14 Mo.

60 DIPPERENT United States, 10c Pricehat free Beidenberg Casaopolia Mich.

PENNY Approvals by Country M. H. Hoerning 192. Parming on Ark

1000 WELL mixed U B 35c Monjar, 1756 Fairmount. Cincinnati. Ohio.

LOW Price U. S. Poreign Approvais. Scott, 30 Buker Ave. Lexington Mass

PREE: Conference Statup, Kliby's Blamp Co., 1658 E Olive, Compton Cuitt,

NICARAGUA-With Rogers set 10t, P. Gus-tafaon, Box 1706, New Britain, Conn.

LIBERIAN Triangle Set-104-With Approvals, Vergo Stamps, Racine, Wisc

TATIONING SUPPLIES

TATTOOING pays big' Anyone can tat-too with our sutting Instructions in-cluded Pres Blastrated Herature. Write Tatooco. 451 S. State. Chicago 5

TATTOO Outsta, inks, designs, Write today Zets Studio, 728 Lands, Rockford,

TAXIDELMY

83

SPORTSMEN—Tan animal skins yourself.
Indian style Make fine buckskins, robes, furs, etc. Simple, easy, no equipment needed instructions \$1.00 L. Wackings, Dept. 6, Johnson City, N Y

TOBACCO-PIPES

PINE Bix Gent Gigars Available soon. Befirst on list for first shipments. Act now Bend no money only name and address to P O. Box 776, Dept. F-612, Chicago 90. IIL

CIGARETTE Papers - Pinest quality gummed or plain. 24 leaf booklets ic Rollers 50c, Postpand, Pete Moberly, Box 766. Owenshoro Kenaucky

Of OARETTES, Cigars, Tobaccos Buying Details for Neison, Sunnyside-PS, Indianapode Indiana

P1PTY Quality Cigars 33 26, \$3 85, \$4.10 \$4.85 Continental Cigars. Coroling N Y

TRAPPING

ELEVEN good Box Traps. Complete blue-prints 30c Wee-Sho-You. Box 51, Detratt, Mich.

TREASURE FINDERS

SEEK Burled Treasure, Methods, mysteries, devices explained. Circulars free Century Press, Box 15.D. Glen Ellyn, 111.

MAGIG Indicator Locates Buried Money and Mineral Deposits, \$20.00 Guaran-teed, C. Horton, Bellevive, Librore.

TREES, SHIRL BS, ROOTS, HERRS

HEALTH Scekers! Learn to Live for Health \$2.50 for 2 bookiets teach you how Dr Chir is a Naturopathic Clinic. 106 E Jackson Elkhart, Ind REALTH

TYPEWRITERS

USED Typewriters Mimeograph, multi-graph Princing devices. Also traded and bought. Dislettraph King, N Carolina

VOCATIONAL GUIDANCE

DETERMINE the occupation offering you the greatest upportunity for success by using scient fic methods. Efficient and econumical service Write Career Counscions.

DISCOVER your best abilities through scientific aptitude tests, information for Testing Service, 507-52 Ous-Electric B.dg , Rockford, Illinois

BT WANTED MISCELLANEOUS

IF you want to Swap Buy or Sell anything. ser'd \$1 for The Nationa, Swappers aide it's chock full of Swappers Schere and Buyers from coast to coast and opportunities to Swap Buy and Se I anything ander the sun National Swappers Guide

PRODUCT suitable for chain store and wide distribution Wanted by AA-1 maintenderer. Send details to R. J. Bernard. Keeper Thomas Co., Cincinnati 12, Ohio. Quick decaton

MERCURY-Highest prices. Free Contain-ers. Write Mercury Terminal, Norwood.

WATCHES

TRAIN yourself for watchmaking, repair, adjustment etc. New all ont unive. Pracare also tools materials. Pully Hautra ed. Sensational value \$2.25 postpaid. Money back guarantee Modern Technical Book Co., Dept. MS. 55 W 42nd St., New York

WATCH and clock repairing-complete practical course in money lessons. Just out! Low price. Information Free, Write - Neison Company, Dept. 8-01-2, Chirage 6.

WATCH and clock repairing increasing, complete home study course with drawings and pictures. Information free Houston Chrimomatic and Watch Co., P O. Box 5357R Houston 12, Texas

GUARANTEED watch and clock ra-pairing, 8-day service. Mai, yours to, Rite-Time 1318 W 95th St., Dept. 2, Chicago, Blanca

WELDING, SOLDERING

SUPER Welder-For home, farm, factory Makes even beginner an expert, Im-proved on type used by Navy Pully equipped with Metallia Are and Flame Turch Handles, Carbons, Rods, Pluxes Mask, etc. Complete directions. Operates AC-DC, 110 Volta. Ru extra wiring needed. Guaranteed, \$19.95 Save 2% send check with order Super Welder Mig. Co., Dept. BN, 23 S. 30 St., New York

NEW Model electric Weider 110 volt AC-DC was weed all metals many to use, full directions Complete with power unit. dame and metallic are attachmenta carbons, floxes, rods mask all for \$19.95-Used by the Navy Magic Welder Mfg Co., 239-P8-9 Canal St., New York City

RODS, 1/16", 5.64", 3 12" Assortment, 200 Rode #1 Pe Fostpaid General AC DO Arc. Guaranteed, Little Wolder Co., Dept. PS. 15766 Blackstone, Detroit 23, Mich. S.x. " Carbona \$1.00

NEW and Used Are Welders and Braters. 220 Volt. 32 Volt. and 110 Volt. Unconditionally Couranteed. Formey Mfg. Co... Fort Collina Colo

MAKE Electric Weider Union Available Scrap Quaranteed to weld Informaated, 6347 Parnell H, Chicago 21, Ill.

THOUSANDS of MEN NOW

Appear Feel Look

with Commander

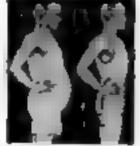
Now yet can get semminous results at code with the new Commander Supporter, Siny plenderiged with this amoning free netion over coinfortable chasts waves garment Once you by it, you is never be without the Commander!

The Secretarian NEW PRINCIPLE Of Abdominal Secont

Class your hands over the abdomen, us to the picture then raine and brees greatly against 1 and native how much better you feel? Stardy previous fabric a RULLY IN with the approal stretch weave of the professional streets and the state of the Commander for ESTRA DOUBLE SUPPORT arrows the abdomen fustantly the Commander finites pade traducation in the Estration of the Commander finites are traducation in the parameter for No bushing on riding the traducation of the traducation of the traduction of traduction of the traduction of traduction of the tra

TRY IT TEN DAYS At Our Exponse Do the loday Send for AT DUB EN PENCE and if you do TOUR WILL BE

return & REPL NO ED prompt.



10 DAY FREE TRIAL COUPON-MAIL TODAY

Ward Green Company 113 W 57 St New Send up The "Comman plus prelate (Stars 2 I may return it for a 2	Turk 18, ider' for 1 to 47)	Free Trini If not satisfie	ed after wearing I	
My waist Rossure		.lify	Helpht	
NAME.			3 3 4 4000044	

We pur pastage if if it is included

Do you want

.. to go to College?

... or to enter a Profession?

(Such as Assounting, Architecture, Nursing, Doubletry, Teaching, Encial Work, Osloopsiky, Broady Culture, Opiometry, Embalming, Chiropody, Loss, Madisine, etc.)

... or get an Office Position?

To get anywhere, you practically MUST 2nish Righ School FIRST You can compare our appropriate for the state of the state o FIRST You can complete our simplified High School Course in SPARE time at home as FAST as your time and abilities permit, Equivalent to resident school work prepares you for codege, pre-professional esseminations, business, industry Standard tests formished Diploma Credit for H S. subjects sirvedy completed. Single subjects if desired, low tujtion, easy terms. American School, Chicago, est. 1997—endersed by educature, Pinish your high school education NOW Write TODAY!

American School, Dept. 9646, Grazul Ave. at 55th St., Chicago 37

Gentlemen Send me FREE ing in subjects checked below.	information covering special train No ob. (gailson on my part.
High School Course Electronics, (intestria)	Dissel Engineering Directing and Dealga
Architocture and Building Automotive Engineering Business Management	Planting Private Sourctory

O Air C	88 I	Gus litias Tras	Radi i na i na		lea	ı	A	atle lesm die	n and	al pr	_		
Name,					 		•						

Name.		 		 	 	
Address	+	 	 	 * * * * * *	 4.6	- 4



FAMILY PLANE COST CUT IN HALF

Taylorcraft "Foursome" Already Flying!



BITORI the war, 4-passenger airplanes were heavy, high-powered and costly. Prices were from \$7,500 to \$15,000 and more

The new Taylorcraft "Foursome" takes the family plane out of this luxury price bracket for the first time in aviation history-yet provides luxury features never before obtainable in an airplane, regardless of price.

For instance: the biggest, roomiest cabin ever built into a 4-passenger plane. Electric starter-no prop spinning. Unlimited visibility—with wide windows all around and the new Taylorcraft one-piece

sunproof windshield. And performance superior to the heavy, costly prewar ships in many respects.

The instrument panel is compact and uncomplicated like the dashboard of your car, and the engine -what an engine! Light, powerful and smooth performing, it harnesses 125 horses - expert aeronautical engineers say it is the best all-around, most economical engine ever built for a 4-passenger plane.

See your local Taylorcraft dealer. He will gladly give you full particulars and tell you how convenient budget payments can be arranged.



Buy War Serlings Bonds and Stamps regularly.

World's Largest Buildons of Side-by-Side Airplanes CORPORATION ALLIANCE, ORIO

How Fighters Shoot Down Planes They Can't See



RADAR DOES IT! In blinding fog, a Grumman Hellcot intercepts and destroys a Jap plane. At right, a night fighter of this type rests on a carrier deck, White-nosed nacelle near wing tip is one of the radar units that guide It unerringly to its quarry.

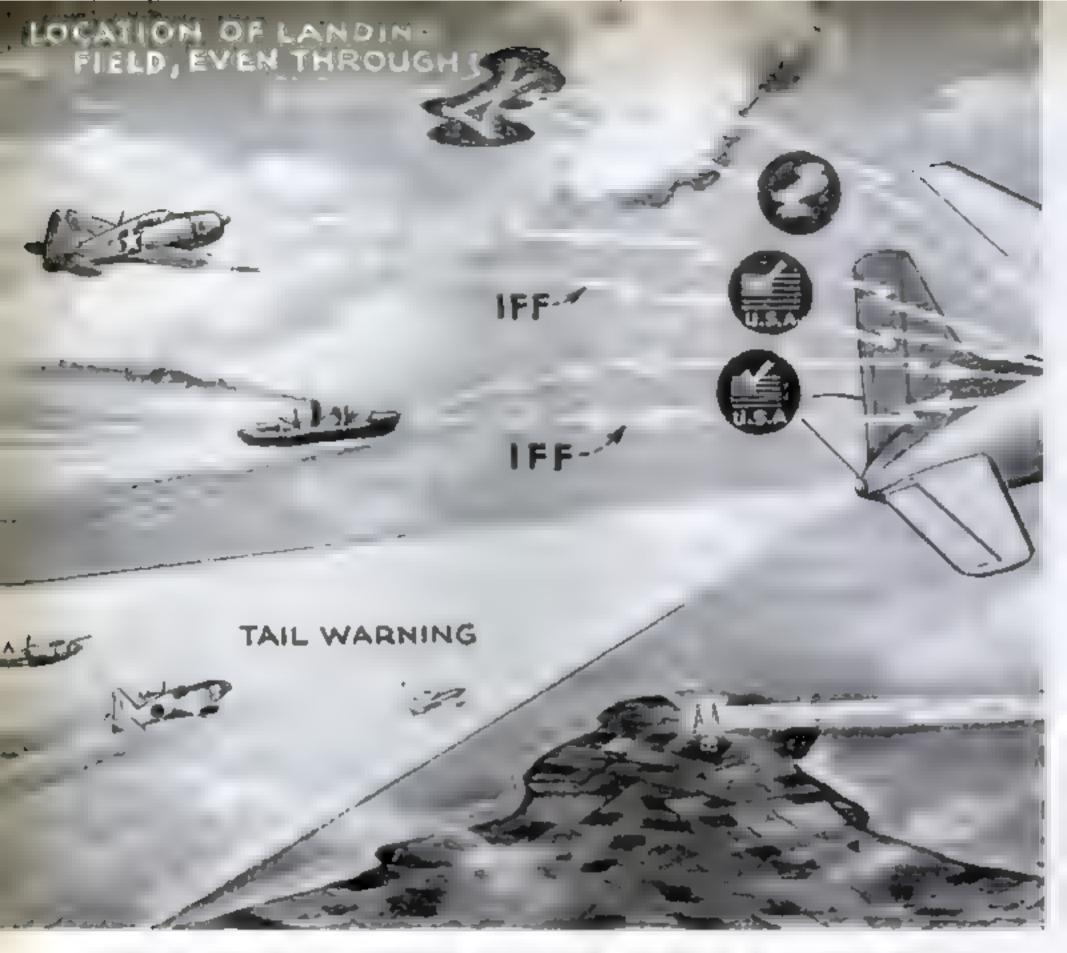
RADAR... Magic Eye That Sees the Invisible

VEIL OF CENSORSHIP LIFTS TO REVEAL NEW SECRETS OF THE VERSATILE WEAPON IN WHICH WE LEAD THE WORLD

By JAMES L. H. PECK Drawings by ERIC SLOANE

RADAR sees all, hears all, and tells all," an AAF pilot once remarked. "It has penetrated everything but the thick veil of secrecy behind which it has been screened." Now that the boys in the Pacific are even using radar to fish with in their spare time, its story has come crackling through censorship, too.

You've seen a searchlight throw a long, focused beam of light into the sky. It fades away into the darkness if it does not hit anything, but if the light strikes an airplane, some of it is reflected back to your eye. Suppose that this searchlight used radio waves instead of light; that it sent these waves out at rapid intervals; that it caught the waves whenever they hit an object and bounced back; and that it computed the distance they had traveled by



SOME OF THE WAYS A BOMBER USES RADAR are shown in this imaginary view. While search radar combs the sky ahead IFF (Identification of Friend or Foe) demands an automatic counters an from unknown planes and ships a radar lang-range navigation beam gives the pilot a bearing for finding his position another device sinces through fag or clouds to reven a target or a landing field, tail warning beam scans a cone astern to detect hostile planes beyond the range of vision

noting how long the remaitrip took them. That's the essence of radar RA to Detection And Ranging).

The radar operator (RCI) on the ground at a fighter-control station on Okiniwa are no incess the detection of an approaling Jap bomber by radiong ne word to a Rank W down crew. Trace He trentills the men in the night fighter 55 nights away the hrection and distance of the rifor Climb to 11,000. Vector, 2-9-7. Range, 42 pules."

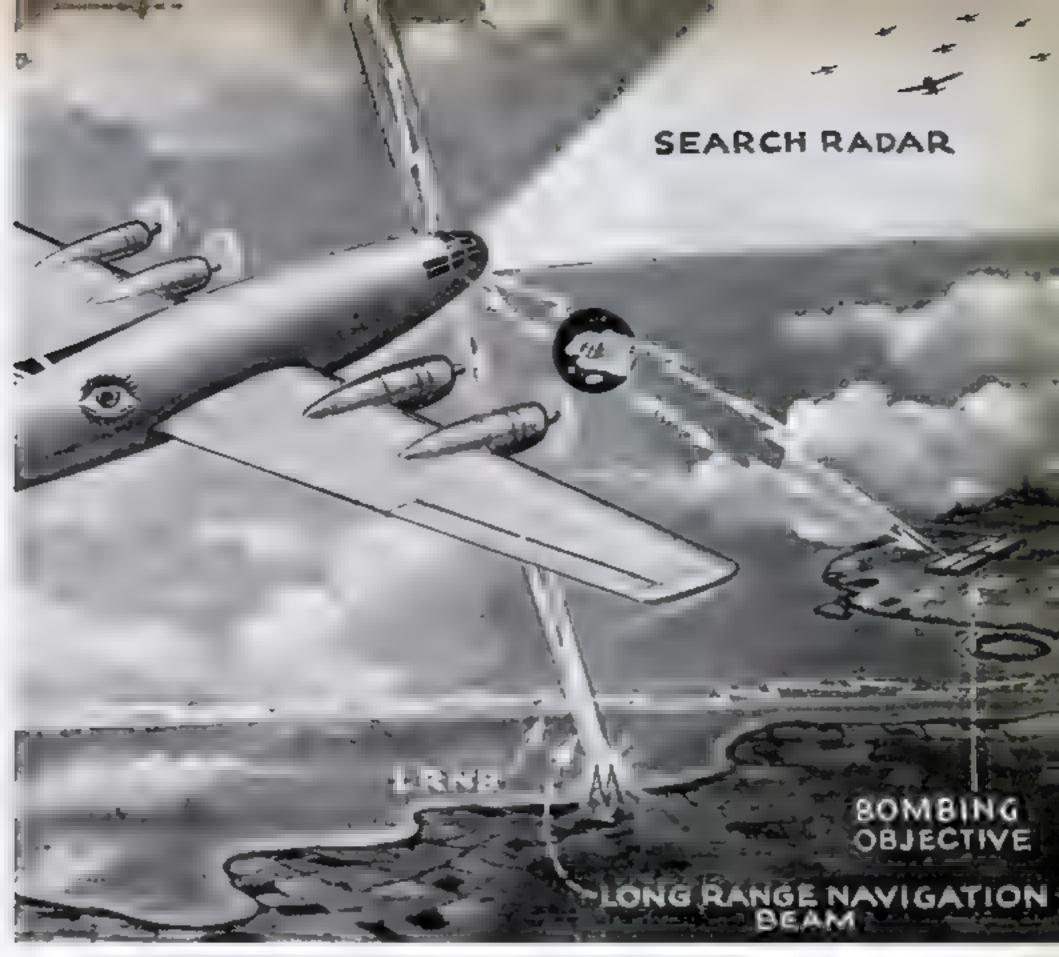
As the Black W. iew banks around to a northwest course and surges forward at 350 miles per hour the railar operator on the ground can note its progress as well as that of the Jap plane. At the same time

another RO in the glussed-in rear of the Black Wisews fuseling adjusts his shorter ranged, airborne-intercept (AI) radar set

Invisible ratio telectric beams are thus should the Jap from both the ground state in and the AAF night highter. Officers in the ground chart the courses of the two is rait on a tablelise potting board as the planes come loser together, another ide word is radiced to the fighter. "Punch."

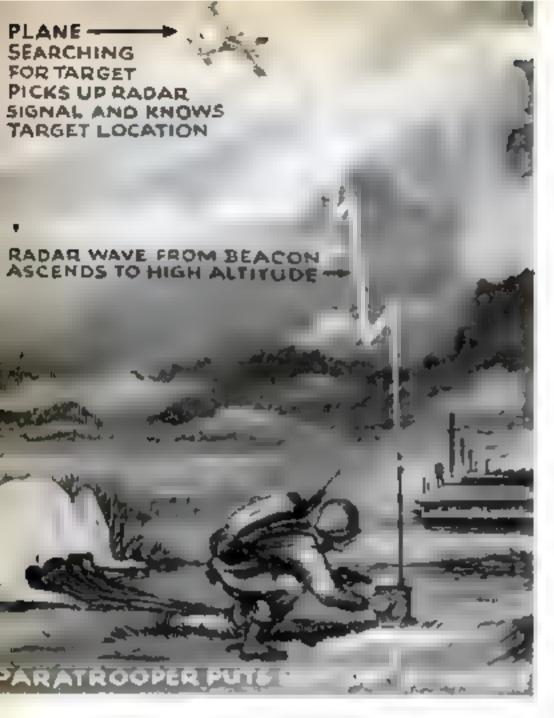
The gunner in the Black Widow, meanwhile makes the adjustments necessary to enable the righter's ratar apparatus to alm and fire its turret machine guns at the enemy

Pilet from radar says the RO in the





A Privateer (Navy patrol-bomber version of the B-24 Liberator) displays a load of rodar godgets. On top of the fuselage, back of the gun turret, is the IFF antenna. Under the belly, the second white "radome" is the "potato masker" for jamming a lemy rodar. The rounded bowl is the retractable "dish" antenna of the ASV (Air to Surface Vessel) search set. Rods behind this are antennas of the radar altimeter.



SMALL RADAR BEACONS can be planted near important targets in enemy territory by paratroopers or commandos. All that our bambers have to do is to "home" on the signals, which guide them to the spot and direct their bambing through overcast. The automatic beacon may even be dropped alone on a parachute by a fast fighter.

RADAR SAVES LIVES of ditched airmen. Life rafts are now equipped with "corner reflectors"—flower-shaped antennas that are set up to throw back the pulses from transmitters of search planes. Reflected pulses create a distinctive pattern on the scope, guiding rescuers directly to the scene.



night fighter when he sees a "blip" of light on the screen of his radar that tells him the waves from his apparatus have begun to bounce back from the Jap. He speaks over the plane's intercom, "Target, 11 miles. Bearing, 20 degrees."

"Roger," says the pilot, and proceeds ac-

cordingly.

"Judy," sings the radar operator in the Black Widow to his colleague at fighter control on the ground; this means that the fighter has spotted the Jap bomber and is taking on the job of destroying it.

Now the RO in the Widow must watch the screens, or radar scopes, on his instrument panel to keep from losing the image of the target. There's a penalty for this, he will be demoted to ground duty if he loses a target three times. As the Widow closes in on the Jap in the darkness, he advises the pilot and gunner: "Dead shead. Range, one mile. Mark, gunner."

That's the gunner's signal to flip a switch that brings the automatic airborne gun layer (AGL) into operation. It will sight and fire the four machine guns at the right instant, even though the men in the Black Widow have not seen the target with their

eyes.

The roar of the two big engines is broken by two short bursts of fire from the .50 caliber guns, directed by the fighter's radar eyes. Flames reveal a Japanese Betty medium bomber, with a kamikaze, or baka bomb, snuggled beneath its belly. The Widow may swing around to let it have a few bursts of visually sighted fire from the four 20-millimeter cannons in her fuselage.

The result will be reported in one word, spoken into the microphone by the RO in the Widow and heard by the men on the

ground: "Murder!"

That is how radar is used in Black Widows. The single-scater Corsair and Hellcat carrier fighters have a different kind of radar equipment (AIA instead of AI) which enables the pilot to do everything The target appears on the radar scope of this apparatus as a large dot of light, and the pilot files so as to keep that dot lined up in the center of his scope. The size of the dot that is the enemy plane tells him when he is within range.

The heart of radar is a cathode-ray tube, shaped like a trumpet, through which electrons are shot. These tiny negative charges of electricity we call electrons bombard and illuminate a fluorescent screen on the flared, wide end of the tube. Alterations in the current result in the formation of light patterns on the dimly glowing screen. The pature of these patterns, and the alterations in the electron stream that cause them, is determined by the very short

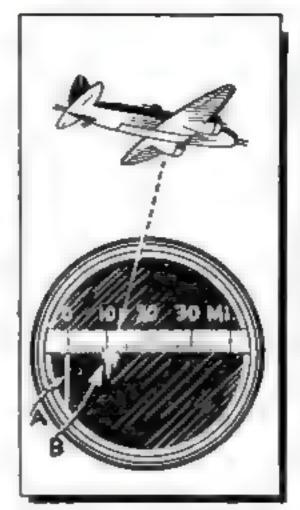
MEASURES FOR DEFENSE AGAINST RADAR

IKE every other revolutionary new weapon, radar has been met with defensive measures. The most common of these are artificial reflecting agencies and "jamming" with other kinds of radio sets.

"Window"—strips of paper-backed tin foil—has been used effectively by both Allied and Axis planes. As shown in these drawings, it is scattered in the air to reflect radar impulses and blur the echo pattern.

Dropped early in a mission, "window" can thwart early - warning radar, making the operator overestimate the bombing force

German "window," good only against microwave radar, was dull black. The Allied type is alivery, like tinsel.



A ground rador station detects a plane by the echo, or "blip," (B) on the scope. Scale shows elapsed time, and therefore the range. The antiaircraft guns then go to work.



2 Scraps of tin foil are scattered by planes to blur the radar echoes, producing a hazy pattern that makes range-finding impossible. This device is used by both Allies and enemy.



3 The pione makes its escape as radar-controlled antiaircraft guns are thrown off their aim. The strawlike strips of paper-backed tin fail are called "window" because, as one British radar sergeant-operator put it, "It makes a window in your scape so big that Jerry flies right through it,"



Radar detection made it so hat for enemy submarines that the Germans adopted the "schnarchel" (breather) for charging batteries while submerged. Here is one on a captured U-boat. It foods when not in use.



The German sub carried radar of its own, for spotting Allied ships and planes. Equipment was mounted on the schnorchel.

radio waves that bounce back from the detected object.

Since the speed of these pulses is the same as the speed of light -which can flash the 186 miles from New York to Baltimore in one thousandth of a second—the time it takes the waves to go from the transmitter antenna to a distant object and back to the cathode tube is extremely brief, but it is measurable. This measurement gives the distance, or range, of the target. The direction, or bearing, of the located object is revealed by the direction in which the radar antenna is aimed. Several types of antennas are used

The Japs do not seem to have the laboratories and the materials to put their radar equipment on a par with American sets. Their present warning and fire-control devices compare only with early 1942 American radar. Their air-borne equipment appears to be

even less efficient. However, they are making intelligent use of what they have.

The Germans, too, got off to a late start in radar development; but, when V-E Day arrived, their warning and fire-control apparatus was nearly as good as ours. The Luftwaffe did not employ airborne sets as widely as did the Allies.

The British led in the development of what they then called "radio-location." They introduced many of the present applications, such as navigation and bombing through the overcast. But their devices had many limitations, which were overcome largely by American scientists and Army and Navy technicians. Although most of our radar experimentation has been carried out as a joint operation, U.S. experts have made more rapid improvements, and more of them. Today, we are farther advanced than any other nation, thanks also to industrial plants such as RCA, Bell, General Electric, Western Electric, Westinghouse, and Philco —to name only a few.

Amazing strides have been made since we used the long-wave, broadcast-frequency types at Pearl Harbor, where Private Joseph Lockhard (officially off duty) detected the unidentified planes that turned out to be Japanese. This long-wave equipment was

also used during the spic Battle of Britain, and is credited—along with the RAF—with saving England. The long broadcast waves provided good range and a wide coverage of the sky. However, the very nature of these radio waves that permitted RO's to scan wide sectors resulted in the formation of blind spots, particularly close to the ground.

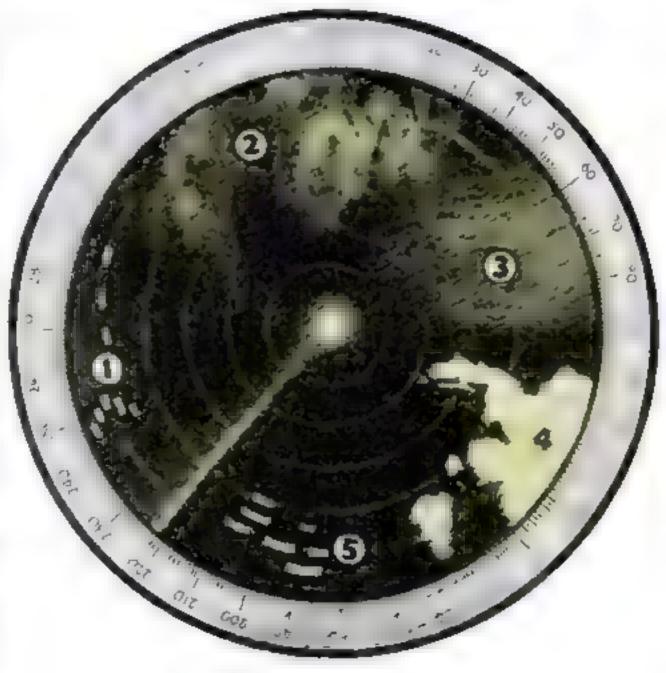
Much of the newer equipment, brought into use since 1942, is of the microwave type. These extremely short waves—measured in terms of megacycles and centimeters, instead of kilocycles as in your radio-do not scatter like broadcast transmissions and have a much better bouncing quality, or "mirror effect." The combination of long- and short-wave radar has been used with great effectiveness. The microwave apparatus covers the blind spots left by the long-wave sets. The latter, like a widely focused searchlight, is effective for finding the target; but the microwave equipment is used to better advantage, like a higherpowered, narrower-beamed spotlight, to put the finger on the enemy after he is first detected.

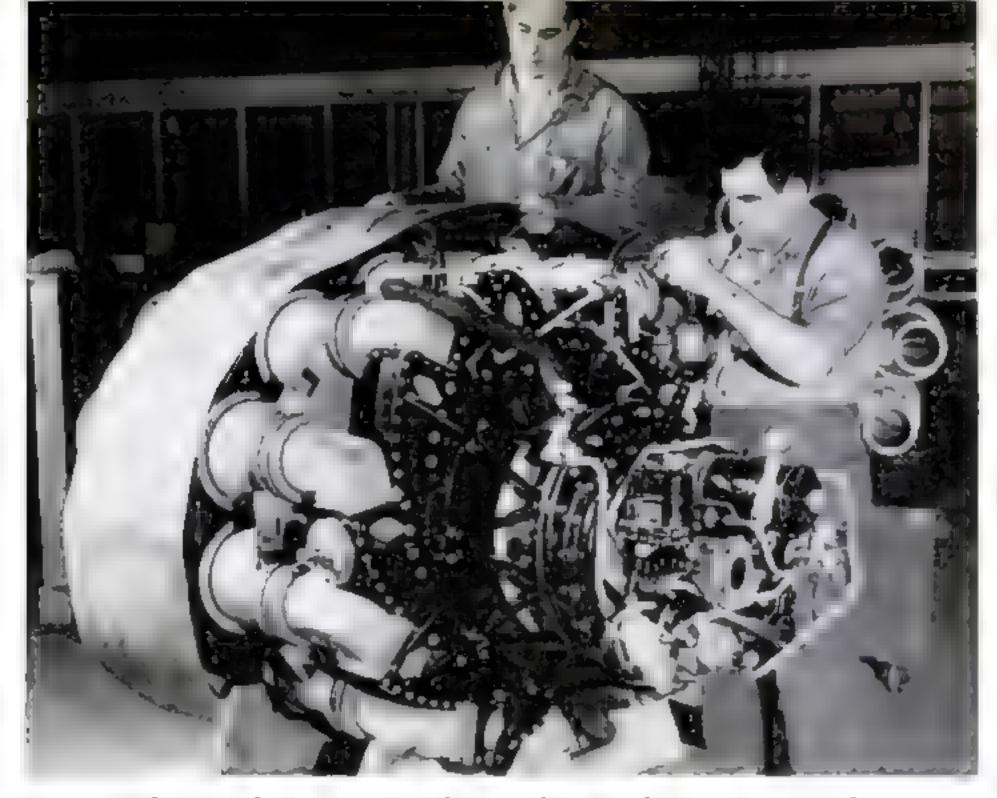
Such detection was the first use to which radar was put; it was purely a device with which the enemy (Continued on page 210)

SEE IF YOU CAN READ THIS RADAR SCOPE

This is the viewing scope of the PPI (Plan Position Indicator). It shows the area below; center dot is plane's position. Numbers on rim give bearing; concentric circles, range. Water areas appear dark, land areas light. The luminous arm sweeps over the area.

- A flight of planes. It may be identified as friendly or hostile by rador challenge (IFF).
- 2 Frontal clouds. Radar also tells the weather lying ahead of plane.
- 3 "Sea return"—echo of radar waves from rough sea—is interference.
- 4 Promontory and islands. Any shore installations?
- 5 Task force of worships. Search planes report their size and course.





Here's What Makes Our Jet Planes the World's Fastest Fighters

WE HAVE been reading and hearing a lot about the spectacular jet plane, but here is the first picture of a jet's power plant to be released for publication. Two of these General Electric engines propel the P-59A Alracomet, while a somewhat similar Super G-E Jet drives the P-80 Shooting Star.

Just inside the front cover shield, at the left, is a compressor, which whips air to combustion chambers. There fuel, usually kerosene, burns fiercely, increasing the velocity of the air and hot gases that pass through a turbine wheel and on out by way of the jet exhaust.

Golf-Ball Picker-Upper Retrieves Pellets and Protects Its Operator

HERE'S a golf-ball retriever that does its job on a practice driving range even while a shower of the white pellets is falling. Towed by a motor scooter, the contraption has 52 wooden disks which turn on an axle as the machine rolls over the fairway. The balls become wedged between the disks and are carried forward. fingers at the front end then knock them into a metal tray. Jerry Claps, of Newark, N. J., is the inventor; his wife, under the acreen, the operator.



"Baseball" Parachutes Don't Wobble Coming Down

A NEW-TYPE parachute, named "baseball" because of its similarity to half of a baseball cover, has the advantage of greater directional accuracy. The conventional parachute, launched from a fast moving plane, leaves almost parallel to the earth. As it opens, it spills air from its upper edge, causing the 'chute to swing in the opposite direction, again spilling air. This is repeated all the way down. A jumper can control this oscillation to some extent by pulling the lines on the side that spills air. The baseball parachute holds most of this air because of its hemispherical shape, thereby eliminating most of the sway. It was developed by Leonard P. Frieder, president of General Textile Mills, New York, and Walter Finken, chief engineer, The design can be used for both cargo and personnel 'chutes.



Biggest Helicopter Carries Crew of Two and 10 Passengers

THE PV-3, first belicopter designed for air-transport operations, is also the first successful one to use two rotors in tandem. The fuselage is 48 feet long and 13 feet high, and houses the Continental-Wright

R-975 engine aft of the cabin. The PV-3 can land in a 100-foot-diameter clearing on land or water. It was designed for Coast Guard and Navy air-sea rescue and transport-service requirements.



U.S. Infantry Fights

Lightweight vests of nylon and thin metallic plates save Gl's from Japanese shell fragments.

By ARTHUR GRAHAME

DODY armor is reducing the number of casualties among the American infantrymen storming into the heart of the Jap homeland.

Like the knight of the Middle Ages, the GI is protected against the lance of battle—in modern war, the shell fragment. The armor is light and compact. It can be shed



Photographs by WILLIAM W. MORRIS and HUBERT LUCKETT

FRONT view of U.S. infantryman's body armor shows the 12pound vest that protects front and back, and the detachable 1½-pound apron, They stop shell fragments causing most wounds.

BACK is shielded down to the waist. The panel at the shoulders unfastens at the top for folding; lower part of back has same protection built into it.



in Aluminum Armor

in a twinkling and packed away in his kit. Except under the most strenuous battle conditions, when ease of movement is paramount, it is worn with comfort.

The adoption of body armor by the Infantry, just announced by the Ordnance Department, means two things: fewer and less serious wounds, and fewer replacements of troops on the battlefield.

Eight percent of all battlefield casualties, and half the deaths, are caused by shell fragments (sometimes erroneously called shrapnel). When the bursting charge of a high-explosive shell detonates, the steel projectile is shattered into thousands of fragments which are thrown unevenly over an area proportionate to the size of the shell These fragments vary widely in size and shape. Some are dustlike particles of steel; others are jagged slivers weighing a small traction of an ounce; comparatively few are larger chunks of metal. They are projected from the bursting shell at a speed of about 3,000 feet a second, but they lose velocity

quickly and seldom are traveling over 1,500 feet a second when they strike. No body armor light enough for a soldier to wear can protect him against a direct hit by a high-explosive projectile, or even from sizable fragments from a burst close to him, but the body armor being supplied to our men can and does protect them against a large majority of fragments.

The GI's armor is designed specifically to stop most shell fragments from penetrating the skin. Most wounds occur in the torso. That's the area the armor protects.

Body armor is not new in this war. Bomber crews have been using it in the form of "flak suits." These are easy to wear because a man in a bomber doesn't move around much. Armor for the warrior with only his own feet for mobility is something else again. It has to be light. It has to leave his movements unrestricted. It has to be styled so that it can be doffed instantly in an emergency.

Army Ordnance produced just that kind

FIT is assured by two sets of snap fasteners on each shoulder strap. This makes it possible for one size to suit all wearers.

CARRYING, The new body armor can be folded compactly, placed in its kit bog, and carried in a pack. In this way, it is ready for use when combat conditions call for it.

JETTISONING is easy whenever the armor becomes a hindrance, as in strenuous combat. All the GI has to do is to give a yank to each of the shoulder straps, step out of armor.





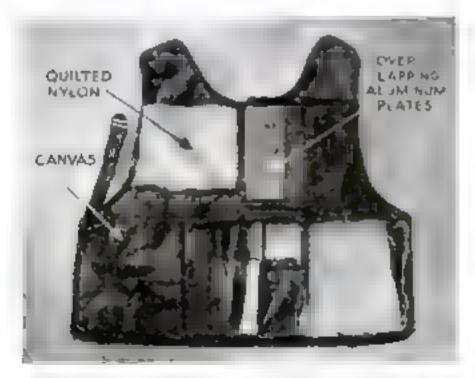




PENETRATION of this vest front by fragments of steel is shown by the holes indicated. Pieces that pass through the three- by five-inch aluminum-olloy plates inside are further slowed by nylon pads.



This back piece took a lot of punishment. Our body armor can't stop all shell fragments, but it protects against the kinds that cause most casualties.



HOW IT'S MADE. Under the cover of the vest are overlapping plates of aluminum allay, backed by pads of quilted nylon. The flexible apron (not shown) contains no metal but gives good protection.

of armor. Ordnance went further. By a series of painstaking tests it determined how much velocity the little pieces of metal plate, backed by quilted pads of multiple-layer nylon, would stop. While the infantryman's armor is considerably lighter than that in a flak suit, it is similar in design.

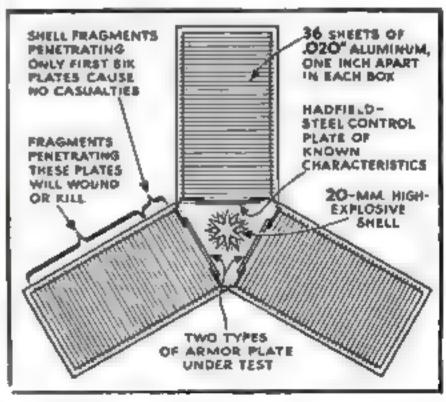
It is a vest weighing 12 pounds that affords protection for both the front and the back of the soldier. The vest consists of aluminum-alloy plates measuring three by five inches—lighter than manganese steel but equally resistant—backed by the nylon pads. Shell fragments that penetrate the plates either are stopped or their velocity is greatly retarded by the nylon fibers. Hit a pillow with your fist. Feel it yield reluctantly. That's what happens when a shell fragment penetrates the armor metal and hits the fabric.

To the vest is attached a small, flexible apron, weighing only a pound and a half and also made of quilted nylon, that protects the lower half of the abdomen.

A jerk on two shoulder straps instantly jettisons both pieces. Vest and apron may be folded compactly and carried in a pack A man jumping from a foxhole and legging it across terrain under fire doesn't want to be encumbered. But a man standing in a landing barge and preparing to hit the beach, and even one crossing a beach under a hail of bullets and artillery shell fragments, finds his body armor the shield and buckler of modern war.

In the development of infantry armor,

TESTING of body-armor plate is done at Aberdeen Proving Ground with the arrangement of steel boxes pictured below. A 20-mm, high-explosive shell hurls fragments against the test plates and the standard control plate. Protective quality of a plate is gauged by the number of aluminum sheets behind it that the fragments penetrate after piercing it.



Ordnance went directly to the experience tables of the Air Forces for information. The Eighth Air Force made the first attempts to protect its flyers against the fragments of flak bursts in 1943 when strategic bombing was being stepped up in the face of determined opposition by German fighters (armed with cannon as well as machine guns) and antiaircraft batteries. Casualties among bomber crews were becoming serious.

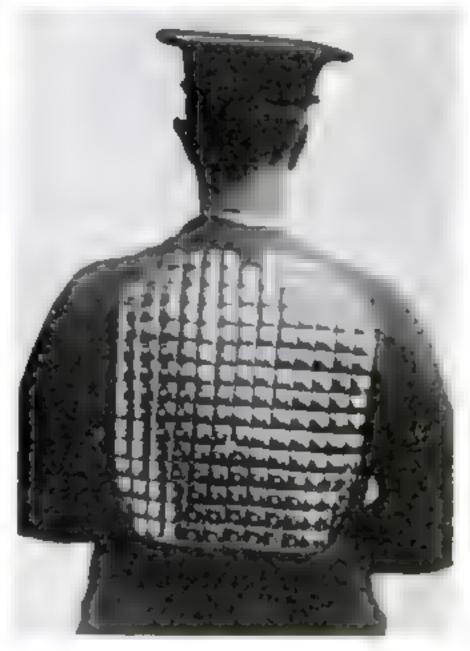
A type of body armor had been developed for infantrymen in World War I but it was too heavy to permit a man to move as fast as he had to in combat. The Eighth Air Force modified one of the 25-year-old suits and placed orders for a limited quantity. They worked, Casualties dropped 60 percent.

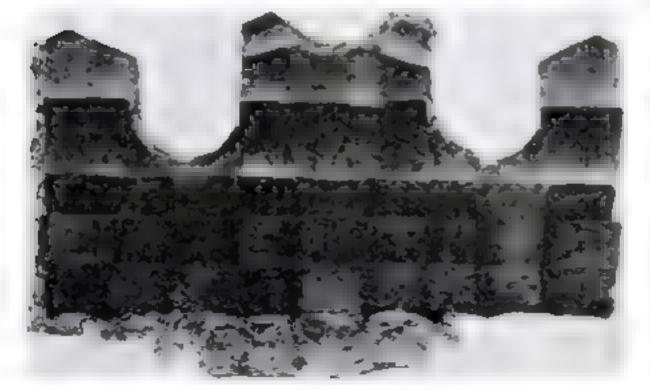
Then samples were sent home to Ordnance. Col. Rene R. Studier, chief of the Small Arms Development Division, was given the job of improving the suit and getting it into quantity production. He found that while it often was saving its wearer from death and wounds, it did show a lot of holes from shell fragments. Colonel Studier pondered that one. Then he made a decision that was to have a profound effect on body-armor design. It was this: the number of holes produced could be disregarded. It was what the shell fragments did after they made the holes that was important.

Apparatus for testing body-armor material was devised and installed at Aberdeen Proving Ground, Maryland. From what was learned in detonating explosives statically an improved flak suit was constructed. It was only a step from a better flak suit to an infantryman's armor.

Pilot models for body armor, and for steel helmets as well, are made just where you would imagine they would be made—in the armor shop of the one place in the United States where an intimate study of devices for protecting the body against wounds has been carried on for many years. It is New York's Metropolitan Museum of Art. The Museum contains magnificent samples of armor going back to the times of the ancient Greeks and Romans. Some of the models are fashioned with the same kind of planishing hammers as were used to repair the dented steel harness of King Richard the Lion-Hearted, back in the days of the Crusaders. (Continued on page 234)

Body Armor Is Not New





1916 Several types of armor for infantrymen were developed in World War I. In Berkley's "flexible armor guard," above, square pieces of metal were riveted to a convas backing. It gave inadequate protection.

Metropolitan Museum of Art.

1400 The Middle Ages were the heyday of armor. At left are the remains of an Italian "brigandine," originally consisting of 53 averlapping from plates riveted to canvas. The length of the canvas indicates that the brigandine covered the abdomen and lains. Openings are holes for the arms.



Stableboys' Cooling-Off Job Is Now Done by Electricity

RACE horses at the Roosevelt Raceway, Westbury, N. Y., are tied to this new electric walker so they may cool off gradually after work on the track. Arms radiating from the motor revolve to keep horses moving at the slow pace generally used.

Navy Issues Insignia for Air Navigators and Flight Nurses

Amond the wing insignia recently approved are those for Naval Aviation Observers (Navigation), shown at upper right, and for Navy Flight Nurses (lower right). The former insigne, consisting of gold wings with a silver compass rose set on crossed anchors, may be worn by eligible Naval officers, including Waves. The Naval Flight Nurse insigne has gold-embossed wings and bears the anchor and oak leaf, symbol of the corps.





Mosquitoproof Cap Protects Gl's Against Malaria

Disease carried by mosquitoes and other insects, to say nothing of discomfort, will be lessened by the development of a "jungle cap" by the AAF Board at the Air Forces Tactical Center, Orlando, Fla. The first cap assembly was made of a snag-resisting, 14-mesh nylon netting attached to the visor and a cellulose acetate window at eye level. Preliminary tests under difficult conditions in southern Florida enabled the Army to improve the cap by extending the visor backward to keep the netting away from the ears. A soft metal ring, which permits folding, is sewed into the netting to hold it down in front and back, and a drawstring secures it around the neck.





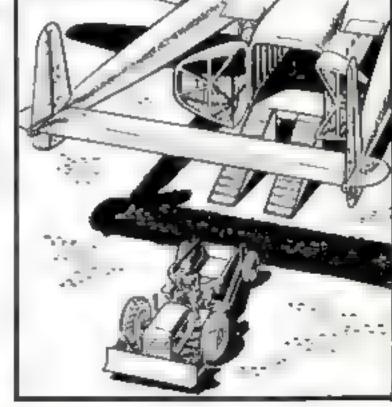
Nylon Pocket Litter Saves Wounded Marines Under Fire

WOUNDED men are brought out of the front lines with greater case and safety by means of a new nylon litter developed by the U.S. Marine Corps Medical Field Research Laboratory at Camp Lejeune, N.C. Measuring 78 by 26 inches and weighing less than 2½ pounds, the litter can be folded to fit in a corpsman's pocket or pouch. Five straps

hold the casualty securely in place, while loops at the head end and sides make it possible to carry him in a variety of ways. One man can drag the litter over the ground, or the wounded man can be raised or lowered over a cliff. Hems at the sides permit use of poles cut on the spot for carrying by two men like a standard semirigid litter.

Army's Airborne Road Scraper Takes Bumps Out of the Road to Tokyo

ARSTRIPS and roads on Pacific islands are being leveled by two-unit scrapers like the one below, which are flown out in giant air transports either assembled or in two sections. Equipped to dig. load, transport, dump, and spread the earth, the machine is powered by a 43-horsepower gasoline engine and mounts a bulldozer blade on the front and a cable-operated steel bowl scraper on a frame in the rear.





Annihilation Bomb - Friend or Foe?

A Statement by the Editors of POPULAR SCIENCE MONTHLY

A CUBIC INCH of a star known to astronomers as the White Dwarf weighs about a ton, almost 6,000 times as much as a cubic inch of lead. This star may have pointed the way to atomic power—a discovery so momentous that the noted French physicist, the Duc de Broglie, calls it comparable only to primitive man's discovery of fire.

How could matter be as compressed as it is in the White Dwarf? One possibility that occurred to scientists was that this star consisted of atomic nuclei from which electrons had escaped. The supposedly indivisible atoms, in other words, appeared to have been broken apart elsewhere in the universe.

On August 6, 1945, an atomic explosion occurred within an annihilation bomb dropped on Hiroshima. Popular Science Monthly has looked forward to such a scientific triumph for many years; its editors are confident now that this discovery will create many more opportunities—not only for warriors, but also for physicists, chemists, astronomers, engineers, and all other men interested in the physical sciences.

Dr. Albert Einstein suggested many years ago that "E equals M times C squared." By this he meant that the energy in a unit of mass could be computed by multiplying the mass by the velocity of light squared. Such computations spurred scientists throughout the world to find a way to release the atom's tremendous energy.

A way has now been found. Even the biggest and the mightiest bombs developed previously could only hurl about familiar kinds of matter; the new atomic bomb is capable of changing minute quantities of matter into more concentrated energy

than can be obtained by any of the world's mightiest machines.

Nine million pounds of ammonium nitrate exploded near Oppau, Germany, in 1921, causing serious damage four miles away. That was the greatest weight of manmade material ever known to have exploded at one time. The exploding charge in the annihilation bomb weighed only a few pounds, but its effects were so devastating that it almost wiped out a city spread over nearly seven square miles.

Even so, Oppau and Hiroshima are scarcely comparable. In the kind of explosion that occurred at Oppau, materials such as steel have been torn into fragments, twisted and strewn over the countryside; at Hiroshima, steel appears to have been turned into gases.

You have seen corn popping in a pan. If the pan is removed from the fire the instant the first grain explodes, no more will explode. If you could see an atomic explosion, you might see something similar, but the units would go on bursting, each one setting off more explosions.

"No one knows how to halt disintegration of matter," Dr. Jean Thibaud of the University of Paris said only four years ago—but the world did not disintegrate when the atomic bomb burst on Hiroshima. Hence, it is clear that ways have been found to release predetermined amounts of atomic energy.

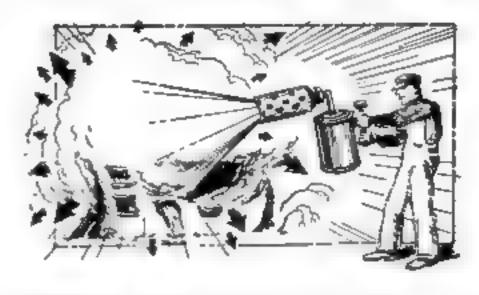
Conceivably, the subjection of some materials to an intensely hot atomic explosion may make them radioactive. How long this radioactivity continues depends on the nature of the material and the force to which it is subjected.

(Continued on Page 230)

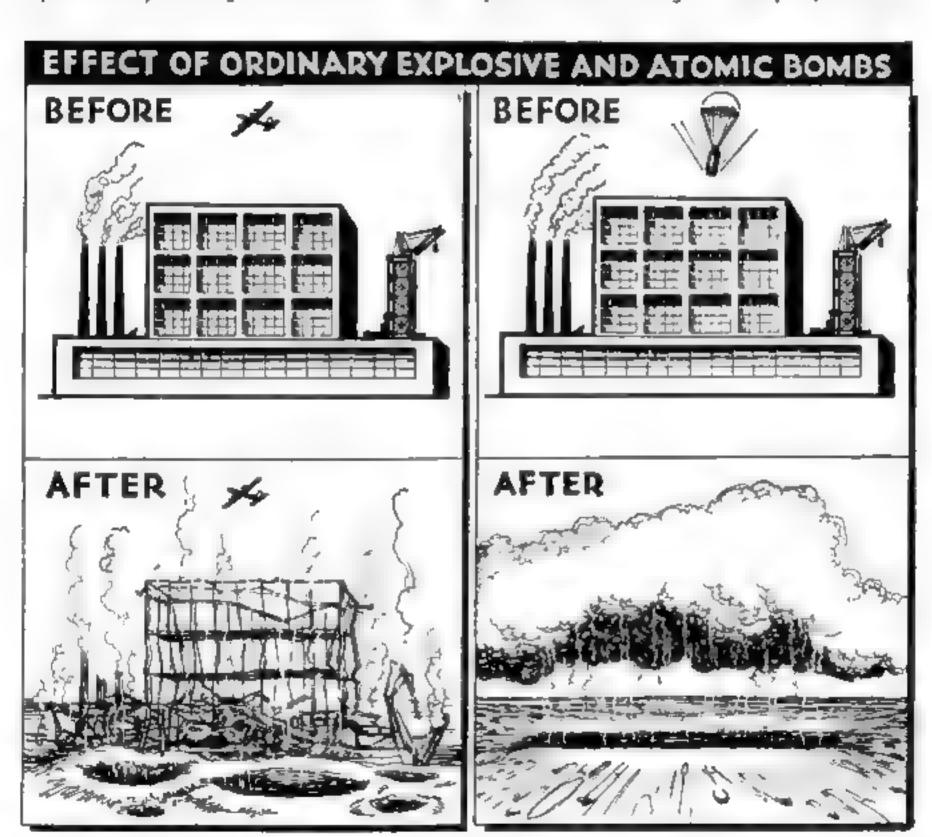
HEAT IS SOURCE OF ATOM BOMB'S DEVASTATING POWER



ORDINARY BOMB ower its destructive power to the release of hat, expanding gases produced by a chemical action in the explosive. The blast and fragments from the bomb push and pull near-by objects violently as though a hurricane had struck.



ATOMIC BOMB releases such tremendous heat that solid materials in the vicinity are vaporized, force exerted is hundreds of thousands of times as great as that from the same weight of ordinary explosives. Effect on target is wholly unprecedented,



When a war plant or other target is hit by highexplosive demotition bombs, damage is limited to the immediate vicinity of hits, plus incidental fires. Even with the heaviest bombardment, it is hard to damage the target beyond all hope of repair. As proved at Hiroshima, a single atomic bomb will completely obliterate the whole target area, turning what was once a busy industrial center into a lifeless and possibly uninhabitable waste. Nothing is left with which the enemy can start over again.

SEPTEMBER, 1945 81

WE'LL HAVE IT AFTER THE WAR

POPULAR SCIENCE presents the first article of a series on products, created or improved by wartime research, which will transform our daily lives after the war.

Soap Washes Hands as Clean as a Surgeon's

THANKS to a new organic chemical with a 32-letter scientific name, your favorite toilet soap may soon take an active part in the fight against disease transmitted by bacteria on the skin. Odorless and nontoxic except to germs—the chemical can be combined with any good soap without changing its appearance, cleansing quality, or scent.

MIXING G-11 WITH SOAP



The new bacteria-killing chemical, Compound G-11, added to ordinary soap, will make it a germicide. It can be added, as in the picture above, in an alcohol solution, or mixed dry with the other soap ingredients as shown below.



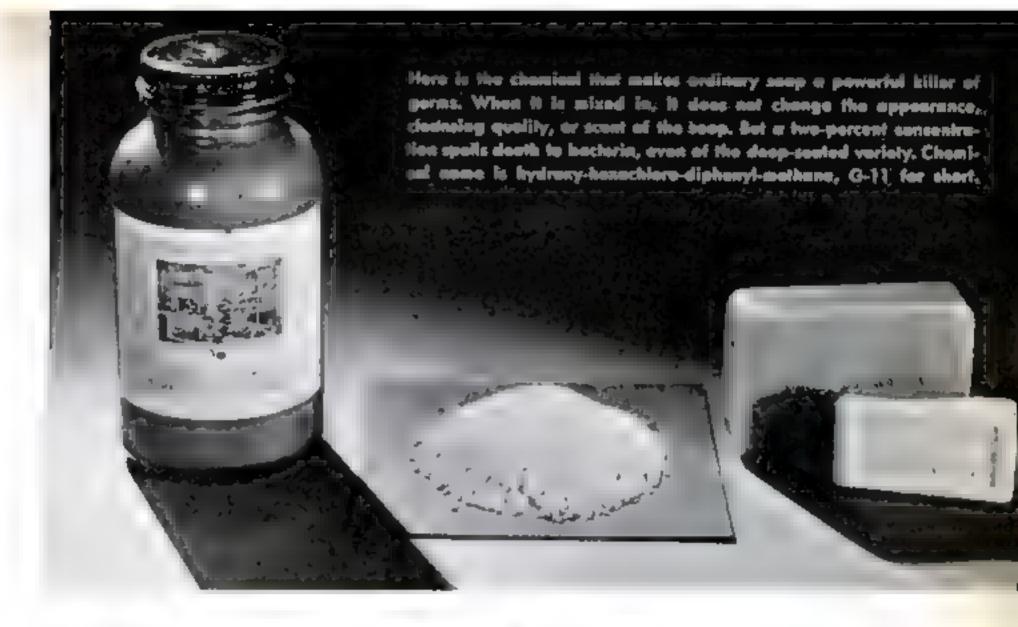
Use of soap containing this new chemical should simplify the present time-consuming scrub-up technique of physicians and surgeons. It would have decided advantages in public washrooms, Army camps, and on ships. In barber shops and beauty parlors, it would reduce skin infections; and in factories, restaurants, and hotels, it might lessen the hazard of communicable diseases. Compound G-11, as the new crystalline substance is called for short, was developed by Dr. William Gump, research chemist of Givaudan-Delawanna, manufacturing perfumers and chemists.

Washing with ordinary soap mechanically removes dirt, oil, and grease, and, along with this soil, a great many germs from the surface of the skin. These are the "transient" bacteria and fungi of all kinds that we pick up by contact with other people and things. Deeper in the skin structure lie the "resident" bacteria, belonging mostly to the group of staphylococci, which are more slowly destroyed. Fortunately, not all of these micro-organisms are harmful. As long as the skin remains healthy and unbroken, none of them, harmful or otherwise, can enter the body. But disease-producing bacteria can be carried on the skin from one person to another.

Although researchers had plenty of bac-

TESTS IN LABORATORY





terla-destroying substances to draw from, most of these became troublesome or ineffective when mixed with soap Indides and organic salts of mercury were among the first tried, but these found only limited use because soap containing them was poisonous and irritating to the skin. Phenol disinfectants failed when mixed in small amounts with soap because the soap ingredients reacted with them, producing new compounds with little germ-killing power,

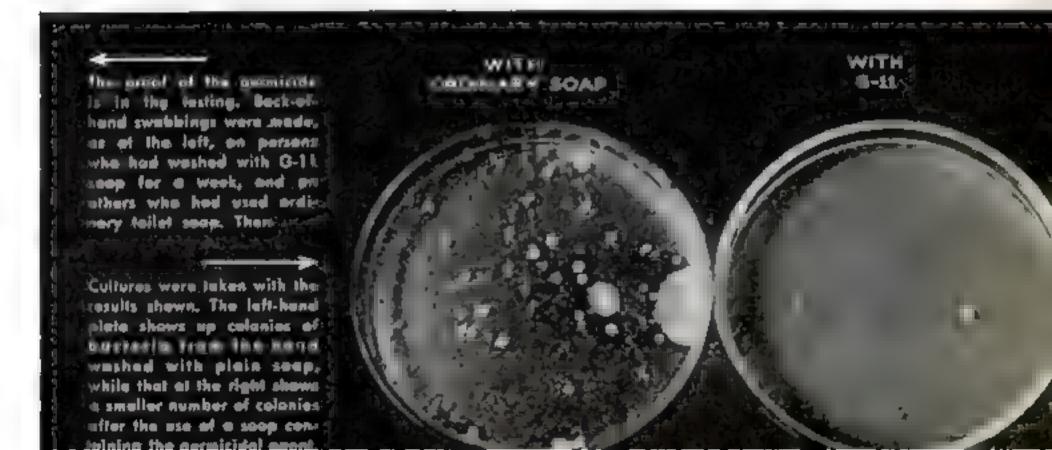
Besides being nonpoisonous and nonirritating, and not reactive with scap materials, the germicide must also be nonvolatile and should not stain the skin or clothing. For popular use, it must not have a disagreeable occur. G-11 is the first substance to meet all these requirements. It is made by condensing two molecules of trichlorophenol with one molecule of formaldehyde.

in the presence of concentrated sulphuric acid. Although the final product is a phenol, it is a complex product that only partially decomposes in the presence of soap. The part that remains unchanged deals death to bacteria.

Although G-11 has special advantages for primarily aseptic needs it is inexpensive enough to be incorporated into all kinds of routine soaps for hand use, bathing, shaving, dishwashing and laun æring. It is possible that the widespread use of such germicidal cleansing might improve the general public health by reducing contagion.

Hundreds of tests made on human subjects prove that washing with soap containing two percent, or even less, of G 11 not only removes and kills most of the skin s transient bacteria, but markedly reduces those resident in the deeper layers

PROVE THAT G-11 KILLS HARMFUL BACTERIA



New Kickless Cannon for GI's

TWO-MAN RECOILLESS GUNS GIVE INFANTRY THE FIREPOWER OF FIELD ARTILLERY

Photographs by WILLIAM W. MORRIS and HUBERT LUCKETT

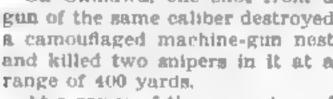
FTER 600 years, armament experts finally have found a way to take the "kick" out of gunfire. The discovery has put into the hands of American soldiers in the Pacific artillery that can be carried ashore on men's shoulders in amphibious operations. Kickless, or recoilless, guns helped root the Japs out of Okinawa. For certain operations, a few infantrymen can lay down as heavy a curtain of fire as a whole battery of medium artillery. They can do it because the Ordnance Department has annulled, for all practical purposes, Isaac Newton's third law of motion: For every action there is an equal and opposite reaction,

Here are a few samples of what recoilless artillery has accomplished;

> Two rounds from a 75-mm, gun, used by the 17th Airborne Division in Germany, knocked out a German 88 and an antialreraft gun concealed in a barn. A hundred Germans tumbled out to surrender.

> On Okinawa, one shot from a gun of the same caliber destroyed a camouflaged machine-gun nest and killed two snipers in it at a range of 400 yards.

> At a range of three quarters of a mile, 11 rounds from a 75-mm.



U. S. KICKLESS GUN

The Germans developed a recoilless gun (below, right) for use by paratroopers, but it is bulky compared with the trim U.S. cannon shown at left and below.



57-MM, Weighing only 45 pounds and 61 inches long, the 57-mm. can be fired from the shoulder as accurately as the Garana. It hurls o 2%-lb, shell 21/2 miles.

75-MM. The trickless 75 can toss a 14-pound. high-explosive shell more then four miles. It is 82 Inches long, weighs 110 pounds, and is fired off a machine-gun tripod. It has both a telescopic and a leaf sight.





In this U.S. Army Ordnance Department photo a group of four of the new 75-mm. recoilless rifles lays down a heavy curtain of fire. Conventional artillery shells are used, but the normal recoil is absorbed by allowing a controlled partian of the propellent gases to escape through openings in the gun's breech.

gun scored two hits on each of two caves concealing Jap artillery. All the Jap gunhers were killed.

At a range of 1% miles, seven shots from a 75 scored three hits in a cave mouth measuring five by two feet.

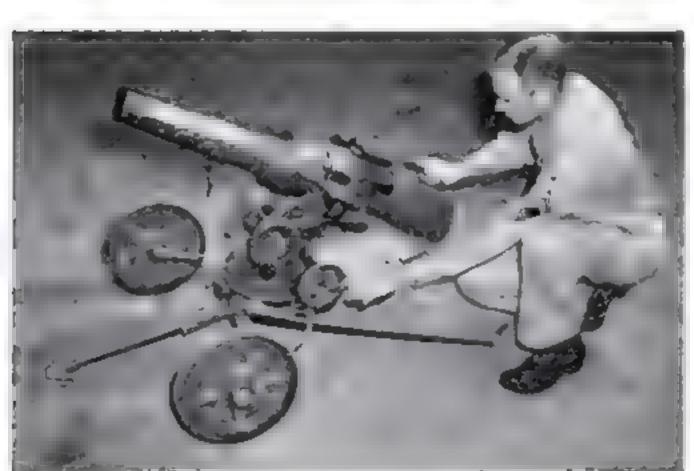
Recoilless guns are not tubes throwing rockets, like the familiar "bazookas." They are guns in every sense of the word. They

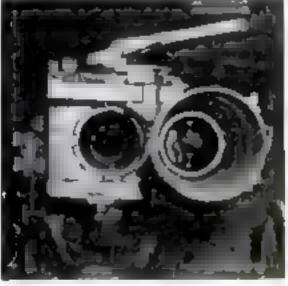
throw explosive ammunition or smoke shells. The shells are propelled by a powder charge. But right there the similarity stops.

All guns, except those of this particular type, "kick" when they are fired. That is because the propelling powder, suddenly becoming gaseous, expands tremendously and seeks an outlet from its confinement. The force of the expansion is exerted in two

SURPASSES THE GERMAN MODEL

The Nati weapon is a 7.5-cm, with a range of 7,400 yords, but it weighs 325 pounds assembled in the field. At the right is a close-up of the gun's breech and (right, below) a blowout patch used to permit gas to escape to take the "kick" out of the gun.







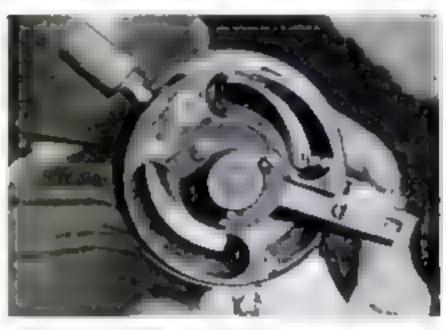


directions: half of it drives the shell from the barrel, half of it kicks back to produce recoil. Much of the weight of any ordinary artillery piece is devoted to a mechanism to absorb recoil.

In obvisting recoil, the U.S. Army has engineered not only one of the great developments of this war but one of the significant advancements in the history of gunfire.



The loader of the two-man crew works from the side when inserting a shell into the mix-bottlelike breech of the 57-mm, gun. After locking the breech, he is clear of the blast that shoots back 40 feet.



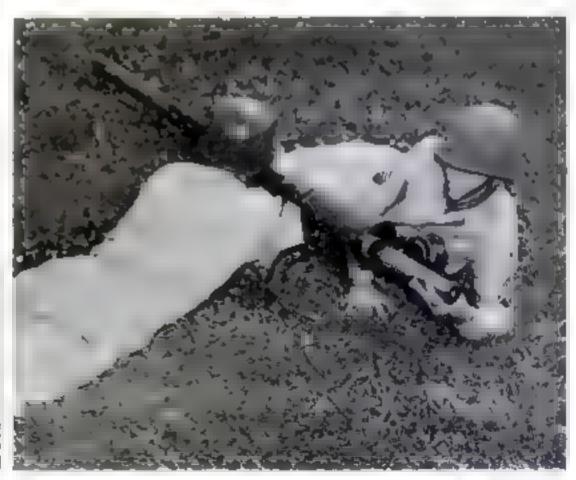
Here's a close-up showing the parts in the breach, through which the propellent gases escape, eliminating the recoil. The powder charge is twice that of the standard artillery shell, so that sufficient gases also drive the projectile out of the barrel.

SHOULDER REST OF 57-MM. IS BIPOD FOR PRONE FIRING

A quick adjustment converts the shoulder rest into a bipad for firing from the prone position. The 57-mm. can also be set on a machine-gun tripad.

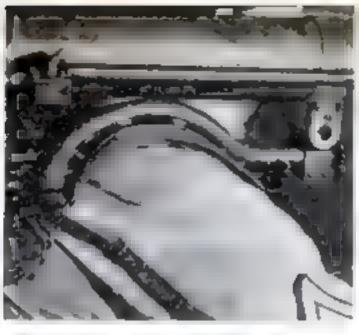
This two-man artillery team presents a small target to the enemy. Loading the weapon is fast and simple, After the loader inserts the charge, he grips handle on the breechblack to close the breech, holding projecting handle on breech to steady gun,







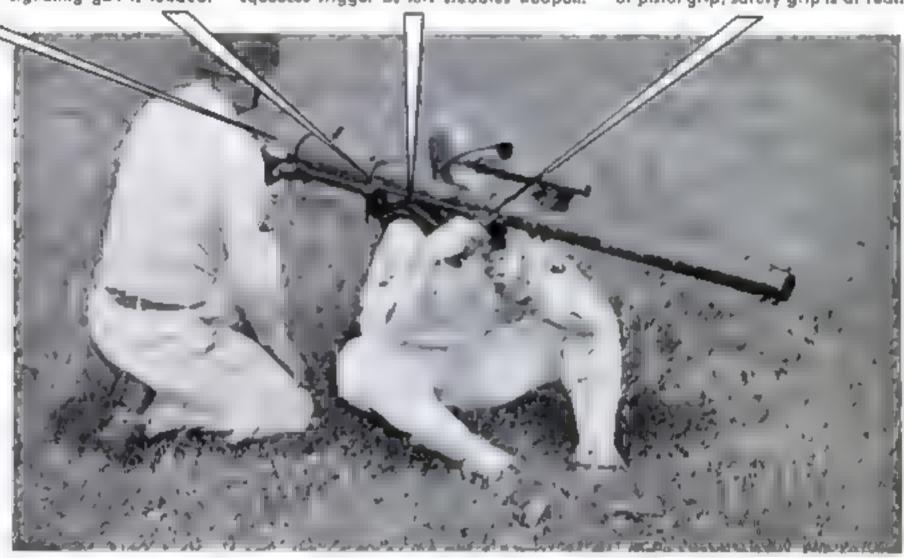
This is loader's safety lever, When he moves it to "F" he taps gunner, signaling gun is loaded.



The new-moon-shaped shoulder piece cushions the gun's weight in the sitting and standing firing positions. Right hand squeezes trigger as left steadles weapon.



Here's the trigger assembly and the leaf sight on the gun's barrel. The trigger is at the forward side of pistal grip; safety grip is at rear.



The recoilless connon looks much like the bazooka from a distance, but, unlike the bazooka, it throws regular high-explosive ammunition or smoke shells which are propelled by a powder charge. Because of the comparatively low mustle velocity, specially shaped projectiles are used which will penetrate most tank armor. Above, the gunner spots his target in the telescope sight of the infantry's artillery weapon.

This is how an American infantryman shoots shells up to three inches in diameter without recoil: As in an ordinary gun, the propelling gases move two ways, forward and back. But those moving back, instead of encountering the sealed breech of the gun, find ports, or holes, permitting escape. The effect is somewhat like pulling a chair out from under someone about to sit down. What should be there simply isn't.

The question naturally arises, if the gases escape from the breech, what drives the shell forward? That's the secret. The loss of gas is compensated for to a large extent by using a larger powder charge than in a conventional gun of the same size. The amount of gas escaping is a controlled portion. The force of the gas expended in push-

ing the shell from the barrel of the gun is exactly balanced by the force lost through the holes.

Shoulder portability for artillery is gained, but in the process something is lost, as we shall see in a moment.

Against the Japanese, American troops are using two calibers of kickless guns, 57 and 75 mm. Each can be transported from ship to shore or across practically any kind of terrain by two men. One man, in fact, can carry the 57 if need be, and fire it. Usually, however, it is handled by a two-man crew—a gunner who carries and fires the weapon and a loader who lugs the ammunition and loads it. Under normal combat conditions the loader can carry six rounds, or 30 pounds (Continued on page 258)



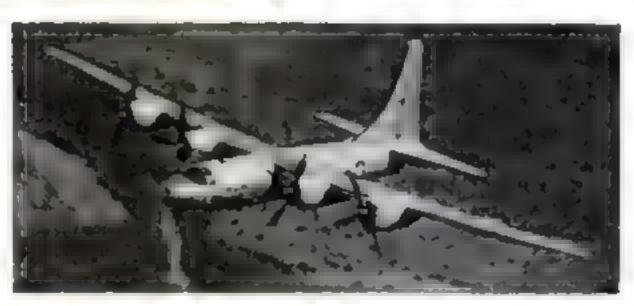
WHAT'S NEW ?

Convair B-32 Bomber Is Hitting the Japs

NEWEST of the AAF's big bombers, the Consolidated Vultee B-32 is now in action in the Pacific. Designing of this big brother of the B-24 Liberator began before Pearl Harbor, and the production model now hitting the Japs is the result of long experimentation. The B-32's 135-foot wing span is only about six feet less than that of the Boeing B-29 Superfortress, It has a gross weight of 100,000 pounds, Four 2,200-hp. Wright Cyclone engines spin 16% foot Curtiss electric reversible-pitch propellers, the largest-diameter props that have ever been installed in any production airplane.

The towering tail surface of the 6-32 rises 32 feet above the ground in taxing position, its vertical surface area totals 236 sq. ft.; rudder alone, 70/2 sq. ft.

The B-32 in flight. Single tail and eiger-shaped fuselage differentiate it from its famous smaller sister, the B-24 Liberator bomber.





Lights Show If Gear Is Down for Safer Landings at Night

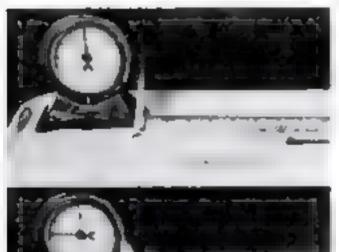
PILOTS of Pennsylvania-Central Airlines planes, coming in for night landings, don't have to worry about whether the retractable landing gear is really down and locked. Mirrors alongside the landing lights in the wings reflect light onto the wheels, affording a positive check on the indication given by a signal lamp on the instrument panel.

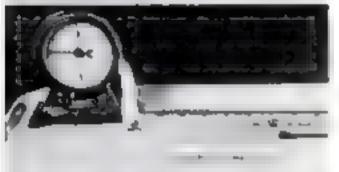


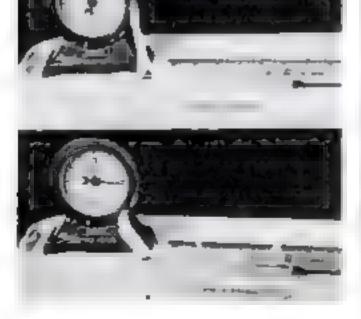
Meet George, the Japanese Answer to the Grumman Hellcat

"LET George do it" will probably be the motto of the Japanese naval air arm, for this fast new fighter is about the best that the Nips can put into the air against our Grumman Hellcats. With its 2,000-hp. Homare 21 engine, George fights in the 400-mph. class and is a little faster than most Allied carrier-borne fighters. Armament consists of four 20-mm. cannon in the wings

and two machine guns mounted in the engine cowling and synchronized to fire through the four-bladed propeller. Allied air experts who know George's potentialities expect that the new ship will be used in short-range land-based operations exclusively. Like "Betty," "Zeke," and other names for various Japanese aircraft types, "George" is a tag applied by U.S. airmen.







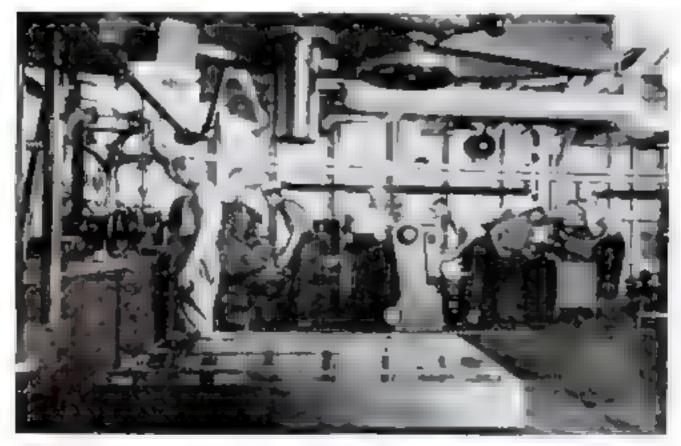
Safety Fuel Ends Flash-Fire Peril

DROPPING a lighted match into high-octane aviation fuel needn't be fatal, if it's the new safety fuel developed by the Standard Oil Company of New Jersey. With the combustion power of 100-octane gasoline, "Safe-T-Fuel" is as safe to handle as kerosene. It must be heated to above 100 degrees F. before it produces vapors that will ignite. In use, it must be fed by direct injection instead of carburetion. The pictures at the left show a test in which it takes 76 seconds for a lighted wick to set a tray of the new fuel affame. Below, a lighted taper is dipped in Safe-T-Fuel without igniting it, while regular aviation gasoline burns flercely after receiving the same treatment. The new fuel actually extinguishes the flame on the taper.





A helicopter rises from a floating 8-29 repair shop to fly afficers to a newly wan airstrip on a Pacific is and Each 'floater' also carries two duck' trucks, two jeeps with trailers and two 30 foot work boats.



All available space below deck is crammed with ma chine tools. The shaps are equipped to handle sheet-metal jabs and to repair airframes, superchargers, carburetors, propellers, electrical systems, radias turrets, and other parts.

Air view (below) of a refitted Liberty ship that ministers to damaged B-29's as a mother ship tends a group of submorines un der its wing. These mobile depots serve until ground units reach advance bases.





Repaired parts and skilled men to install them are flown to a field ashare in a panton-equipped helicopter. The suagaing mechanics can do just about anything in servicing the 55,000 parts of the big bombers.

Seagoing Shops Keep the B-29's Pounding Japan

All that our Superfortresses need is a place to land. The floating repair unit anchors near by and keeps 'em flying until ground bases can be set up.

By T/SGT, AMOS LANDMAN

DY BRINGING the repair base to the Superfortress, instead of vice versa, the timetable of the Pacific war has been speeded up two to six months. The Army Air Forces now reveals another of its schemes for blasting the Japs in their homelands—complete repair shops aboard Liberty ships.

Those floating repair bases simply pull up alongside a newly captured island and go directly to work to keep the B-29's in tiptop shape for their mighty bombing attacks. They can do just about anything in servicing the 55,000 parts of the big planes. After there has been time to establish repair bases on land, the floating shops pull up anchor and move on to the next island.

The Liberty ships, which were converted to their new use by the Air Technical Service Command, are known officially as Aircraft Repair Units (Floating), but the seagoing AAF mechanics who work aboard them have boiled it down to "floater."

Not only is this new-type ship fitted with such shops as are needed for its mission, but it also is equipped with quarters and mess facilities for its personnel work, intelligence officer, finance officer, chaplain, laundry, PX, library, movies, and a complete hospital.

Floaters carry their own local transportation, for use at the scene of operations, right on their backs. Perched above the forward portion of the main deck is a 72-by-40-foot flight deck from which Sikorsky R-4B helicopters operate. Just aft of the flight deck are two "ducks" and two jeeps with trailers. On the fantail are two 30-foot work boats.

Here's how the floater works: When B-29 operations began in Salpan last November, the planes were experiencing trouble with



Finest precision work is done in this instrument shop, where compasses, bombsights, gyros, gauges, and other vital parts are completely overhauled. Many of these men were watchmakers in civilian life.

their prop governor heads. A clip which held a resistor was defective. The vibration of the engines loosened the clip, and the resistor, which looks like a cartridgetype fuse, popped out of the clip, got into the moving parts of the governor, and sometimes ripped it to pieces.

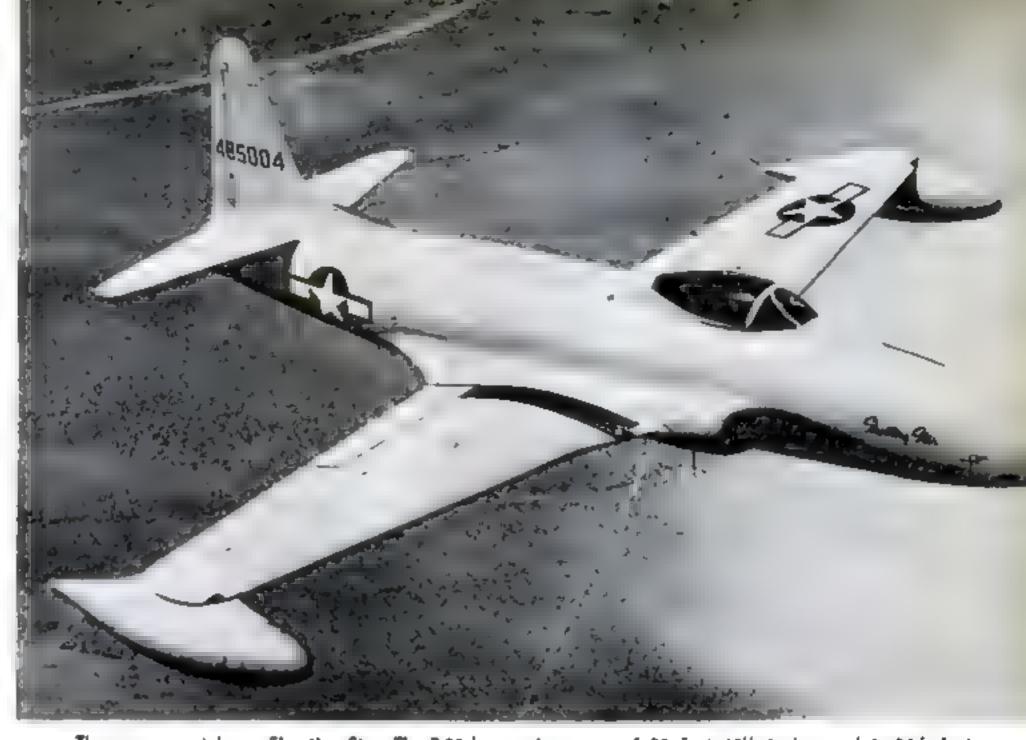
One of the floaters arrived in Saipan the day before the first Tokyo raid, and dropped anchor in Garapan harbor. Tactical outfits at Iseley Field rushed some 50 damaged prop governor heads to it for repair. Working at top speed, robbing some of the beat-up mechanisms for parts, and improvising, the men of the floater that night had a number of governor heads in serviceable condition.

The repair units are equipped with the following shops: machine shop, welding, sheet metal, heat treating, electroplating, ordnance, turret, ground and airborne radar, radio, camera repair, propeller, carburetor, turbo-supercharger, electrical, paint-dope-and-fabric, woodwork, instrument, bomb-sight, tire, fuel cell, parachute rigging, and drafting. There is a plant for the generation of aviators' breathing oxygen, the largest mobile plant of this kind overseas.

The B-29's aren't the only customers. The floaters have done work on P-51's and can handle work from any other planes, Army or Navy. One outfit even manufactured some gears for Seabee buildozers when the Seabees were in a jam, and another capped the tires of a general's staff car.

Repairmen prime the oil pump of a 8-29 turbo-supercharger. This department can overhaul 20 Internal or gear-driven superchargers a month. Sandblasting of parts is done in the ship's electroplating room.





The camera catches a Shooting Star. The P-80 has a wing span of 38 feet 10½ inches and is 34½ feet long. This one is carrying auxiliary fuel tanks on its wing tips for use in long-range missions.

P-80 Secrets Revealed

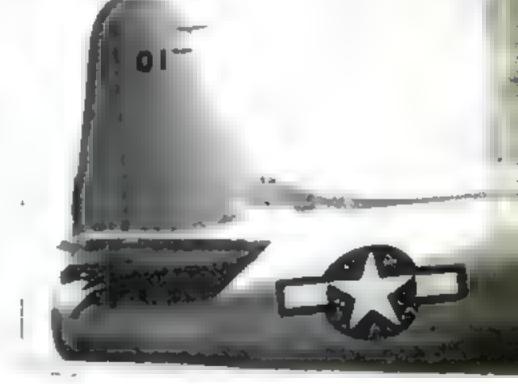
CLEARER picture of the fastest plane in the world, the Lockheed P-80 Shooting Star, is given by photographs just released for publication and performance details now made available for the first time.

It can now be revealed that this jet fighter has a ceiling well above 45,000 feet. Armament is six .50 caliber machine guns in the nose. The pilot is protected by a bullet-resisting glass windshield and by armor plate fore and aft of his seat. Air pressure in the cockpit is automatically reduced in combat to prevent explosive decompression if a bullet hits the canopy.

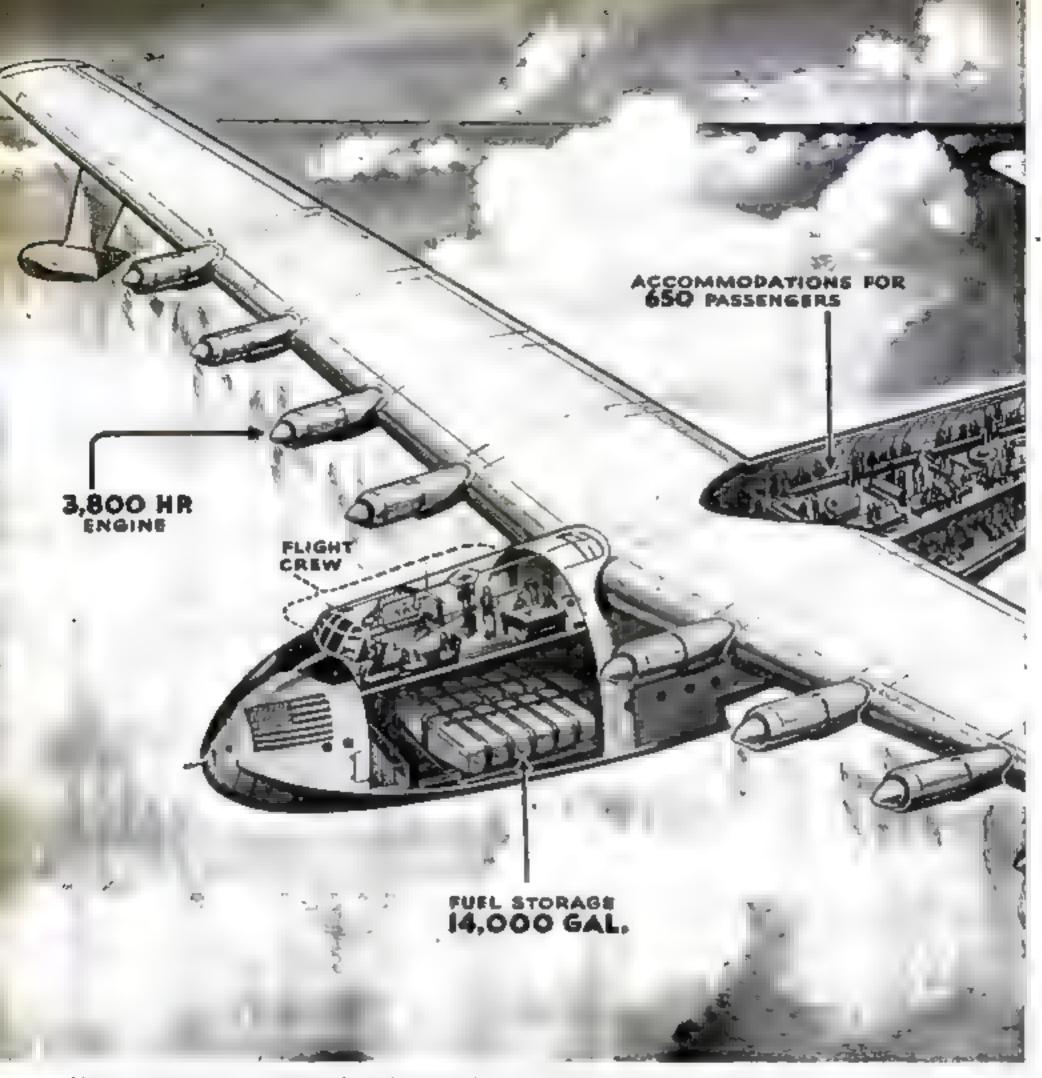
Gross take-off weight of the P-80 is about 14,000 pounds, some two tons less than that of the P-38 Lightning. The kerosene-burning General Electric jet engine, which has only one moving part and requires no warm-up period, can be completely changed in less than 20 minutes. There is only one engine control: the throttle.

ground, the Shooting Star is able to use extremely low tricycle landing gear. A "piano finish" is given the whole outside surface of the plane by the use of a special primer with baking, waxing, and rubbing.

engine control: the throttle. Because it has no propeller to clear the



No trail of smoke or flame is left by the blast of" hat gases issuing from the jet nozzle at the tail.



This cutaway drawing of Howard Hughes' H-4 shows the vast interior that could hold a paylood of 60 tons.

Looking Inside the

Howard Hughes' all-plywood flying boat, with eight 3,000-hp. engines, will fly 3,500 miles fully loaded.

Drawings by ERIC SLOANE

NDER secret construction for almost three years, the world's biggest airplane has just been revealed in all its giant proportions. It's the \$20,000,000 mystery ship on which Howard Hughes has been working, with Henry Kaiser as a partner until a while back, and is now called merely the H-4.

We thought the Superfortress a pretty fair ship for size, with its 141-foot wing



The giant could be a cargo carrier, transport, or haspital ship, and fly nonstop from Handlulu to Tokyo.

World's Largest Plane

span. But the H-4 is big enough to accommodate a Superfort on each wing with room to spare. It has eight engines with a total horsepower of at least 24,000.

The giant's wingspread is 320 feet—longer than a football field. Its hull—it's a flying boat—is 220 feet long and about three stories high. Gross weight will be 400,000 pounds, or 200 tons.

It will be able to carry 650 passengers, with plenty of baggage, across the Atlantic nonstop, or across the Pacific with one stop. Or it can carry a 60-ton Sherman tank, or two medium tanks, or three light tanks. It could take 400 soldiers with five tons of ammunition and equipment across the ocean and bring back 350 wounded with 40 or 50 nurses and doctors. (Continued)



WING SPAN is longer than a football field, and thickness at the hull is 13 feet. In this factory scene, expert cabinetmakers have the wing almost finished. One of the H-4s two pontons also is shown.

The H-4 is the fruit of much dreaming and planning by Howard Hughes and Henry Kaiser, followed by a remarkable construction job now nearing completion at Culver City, Calif. They got together in 1942 on

the plans for this ship, and started work on it late that year.

The plane is almost entirely constructed of wood strips, glued together. The metal in it, aside from the engines, is negligible. Skin and structural parts are built up of birch and spruce, layer on layer, formed into durable units by modern techniques and the use of new water-Thinnest proof glues. parts of the H-4 are 3/64 of an inch, built up of three 1/84-inch veneers. The thickest part is ten inches, built of 200 veneers 1/20 of an inch thick. The workers mostly skilled cabinetmakers, who know their wood and their glue.

Construction of wings and hull is virtually complete now. The next big job is to move them 22 miles to San Pedro Harbor, where a special graving dock and hangar are being

constructed at a cost of \$203,000. The moving job entails the removal of some 30 power lines and two buildings along the route.

The first flight of the big ship will take place some months hence. When Howard Hughes takes the controls for this flight, he will be sitting 24 feet above the water. The H-4 is not a speedy plane Its climbing rate is 675 feet per minute, cruising speed 145 miles, ceiling 17,000 feet. Its tanks will hold 14,000 galions of gasoline. It requires a run of 5,600 feet to obtain a speed of 86 m.p.h. for the take-off, and this takes 67 seconds.

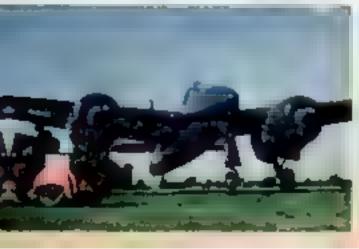
EACH PONTON is taller than a man. Mounted on two such floots and the high, deep struts, the wings would clear a two-story building with room to spare.



low Pin-Up

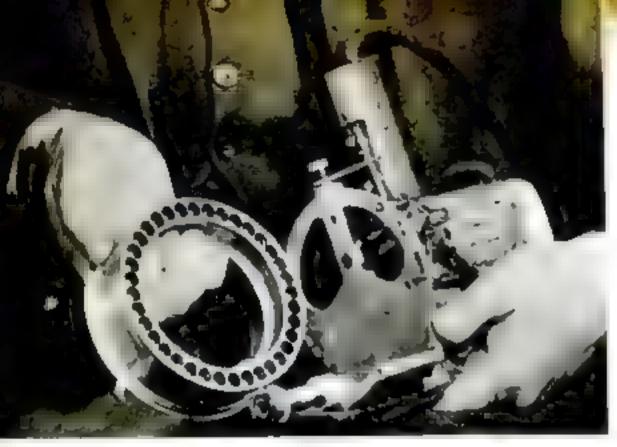
GRUMMAN F7F TIGERCAT NAVY FIGHTER. With twice the power of the famous Hellcat and 50 percent more weight, this twin-engine ship is described as the most powerful fighter-bomber yet produced for the Navy. First Navy fighter to have twin engines, it is powered by two 2,100-hp. Pratt & Whitney Double Wasps that put it in the 425-m.p.h. class and give it a mile-a-minute climb. It can carry two tons of bombs, a full-size marine torpedo, or any desired combination of rockets and bombs. With heavier firepower than either the Hellcat or the Corsair, it can smash even a bomber with a single burst. A two-place model is being made for night fighting. First production goes to the Marines; later, Tigercats will fly from our 45,000-ton carriers of the new Midway class.











AUTOMATIC SCREWDRIVER, electric or air operated, drives all standard or special-head acrews into wood or metal to a predetermined depth. The detachable magazine is refilled in a few seconds. Manufacturer is the Reed-Prentice Corp., Worcester. Mass.

NEW Tools





SAWING AND FILING with the drill press are made possible by an attachment developed by H. R. Greene, of South Bend, Ind. Attached in about three minutes, it saws the hardest wood up to an inch thick, very thin plywood, or sheet metal, besides doing various filing jobs on small castings and other work

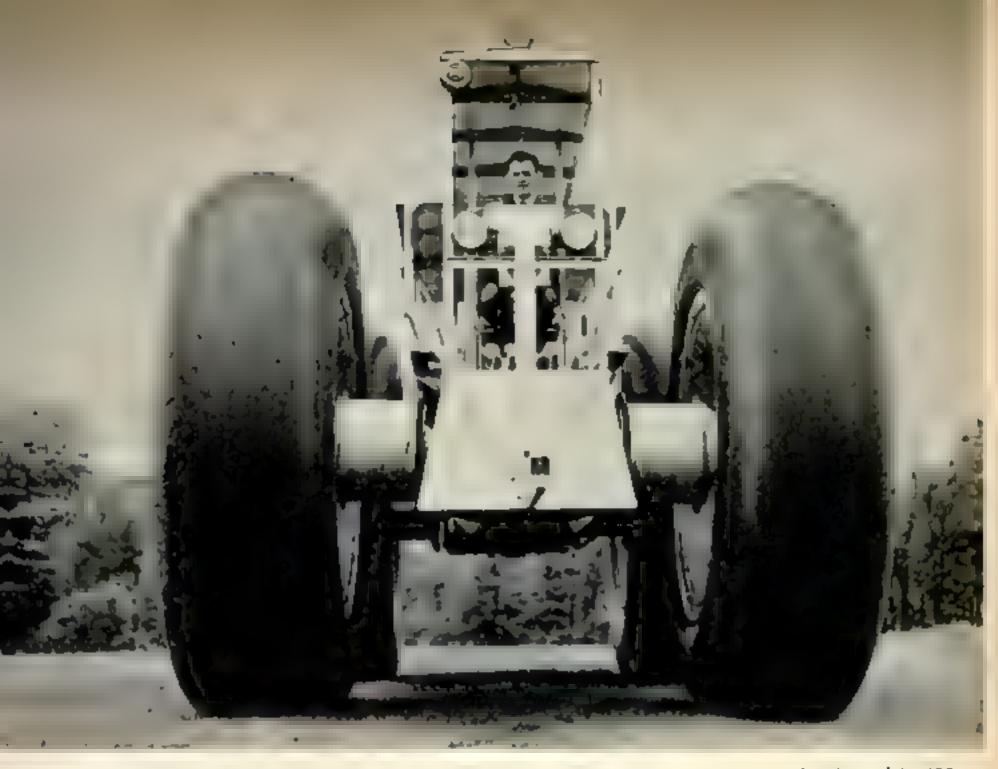




DRAFTING AIDS. Plexiglas disks, rolled along the edge of a curved ruler (above), draw parallel lines. The improved lettering triangle below, devised by Llewellyn Price, Fort Washington, Pa., includes fiber strips that raise it above the paper for ink work.



THIS SCALE COUNTS small parts to speed production in war plants. The parts are put in the pan, and the worker reads the number directly from the dial, J. H. Keeney & Co., Chicago, are the makers.

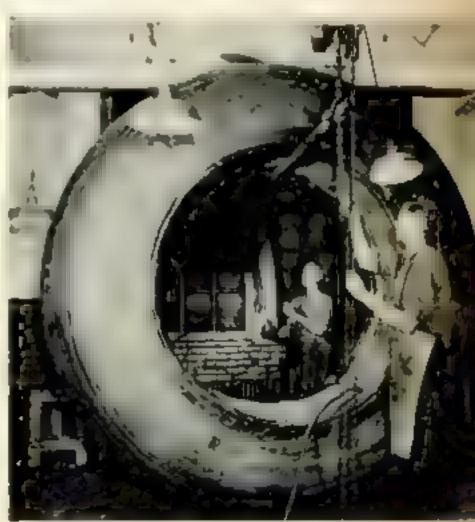


How would you like to change a tire on this marsh buggy ? These synthetic-rubber doughtets (size 120 x 33 50) weigh 315 pounds each their new tubes 175 pounds. Normal inflation is three or four pounds.

120-Inch Tires Carry Oil Prospectors Through Swamps

ROLLING across sand swamps and deep water, "marsh bugges are taking petro-leum hunters to places that could and be reached with boats or beasts of burden. Developed 10 years ago by the Gulf Oil Company for use in the Louisiana bayon curity (PSM Mar 37 p 40), these strange vehicles became a valuable war aid in the scarch for oil all around the Gulf of Mexico and the Caribbean. Their 10-foot tires are the tallest ever make by Goodyean





A grant tire casing begins to take form as Good year workmen inflate a shaping bag inside it. Air pressure in the bag molds the rubber casing which has previously been fabricated on a building drum.

A marsh buggy licks "tself along in water at four miles on hour. Air in the big tires and in the hollow drumlike wheels gives it buoyancy.

Jack Eigner airbrushes the last color onto his three-dimentional paper caricature of President Abraham Lincoln.



Winston Churchill, with his inevitable Havana, is a natural for paper sculpture. Frank Sinatra, at right, will probably be recognized by teen-age bobby-sozers.

He Draws Scissons Scissons

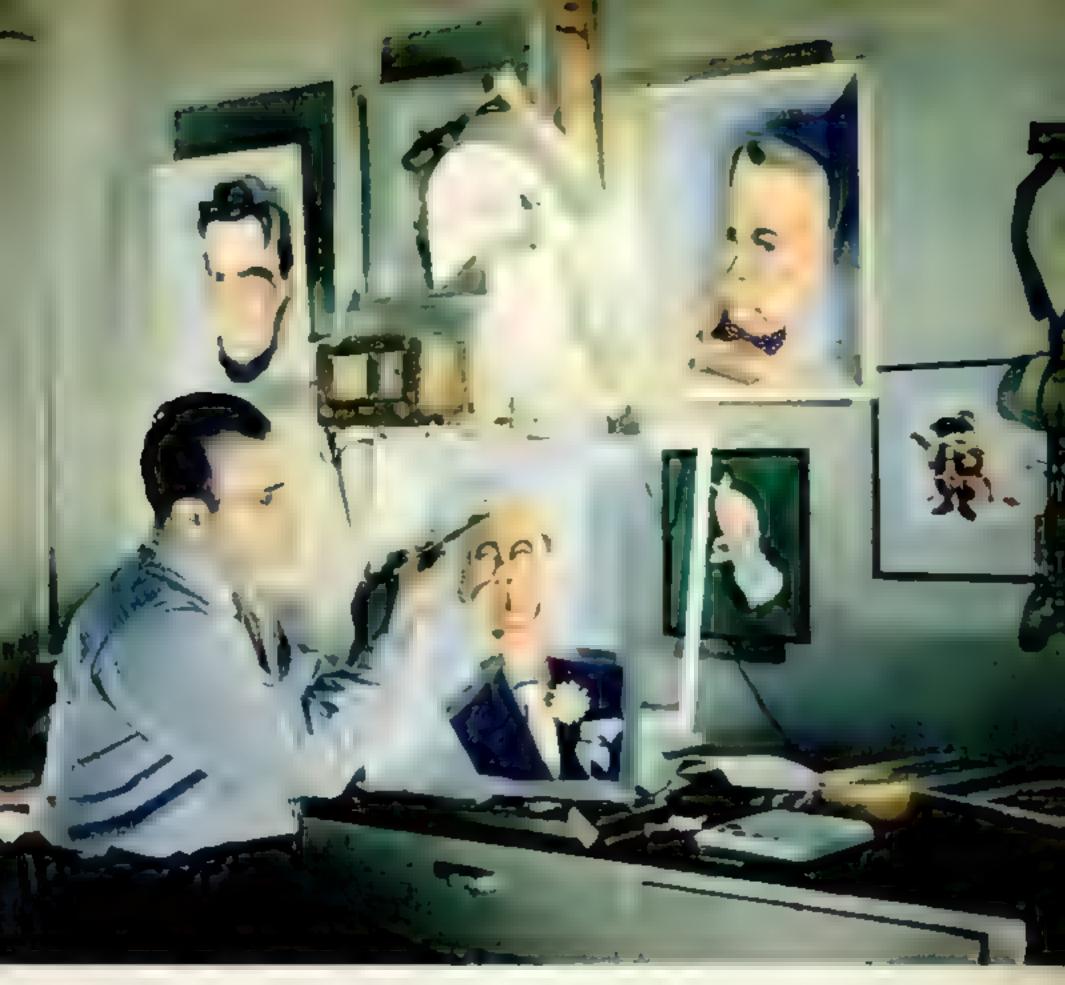
JACK EISNER MAKES FACES IN THREE DIMENSIONS

By DeVERA BERNSOHN
Photographs by ROBERT F. SMITH

ACK EISNER is a perfect cut-up. It s a common belief that artists are frequently that way; but here is Eisner actually making a successful business of it—or, let us say, a profession. Scissors are the backbone of his business, plus glue and paint. With these he creates three-dimensional paper caricatures of men in the news, and dramatic story-telling models for window displays

In his whimsical studies of famous people, he pokes usually good-natured fun at such celebrities in politics, business, and the professions as Winston Churchill, the Duke





In the Eisner studio, the Duke of Windsor takes a trimming. The ducal nose on the coricature is part of a wooden ball, the clothing is scraps of material glued anto paper: bautanniers, an artificial flower.

of Windsor, Henry Ford, Jimmy Durante Frank Sinatra, and, incidentally, himself One exception to his good nature was in his portrayal of the late (?) Herr Schickelgruber, in which he omitted his customary geniality In fact, the thing was pretty poisonous.

Eisner creates his mischievous carica tures by using paper built out from the background in successive planes, which are bent, curved, and colored with either a bristle brush or airbrush. Thus the artist gets length, breadth, and thickness, and this achievement brings him fairly close to the classification of sculptor. Many of the spoof portraits are life-size heads, while others are made in the form of small busts or full-length statuettes.

They're based on study, too-photographs, or maybe first hand acquaintance

After getting the general idea in mind, Eisner goes to work and makes a rough sketch. If he is satisfied with this—and he is not easy to suit—he draws it more carefully on tissue paper. This filmsy is a diagram that shows in detail the base of the profile or full face; also the individual features, all of which have to be cut out separately

So far, so good. Then the sketch has to be transferred to heavy drawing paper, a simple matter of rubbing the back of the tissue-paper drawing with a heavy pencil. When Eisner has accomplished this, he goes over the lines again with a sharp pencil Then he leaves a slight margin to allow for the curvature that will be an important part of the finished work.

Now the scissors come into play, prefer-





To show how caricatures are made. Eisner (left) uses himself as a model. He sketches face on tracing paper, marking parts to be painted or cut out and glued anto the base in separate planes.

2 Cutting out the sketch, after it has been transferred to drawing paper. Allowance is made so that when cut-out is glued to cardboard, the facial bulge will be permanent. Trimmings are put to use.





3 Here the paper sculptor glues the nose onto the face. Cheeks will then be applied in the same manner. To keep such features from collapsing as adhesive dries, small cardboard props are inserted

Approaching completion, the paper caricature is airbrushed with natural skin colors, and the hair, eyebrows, and lips are painted on. Coloring seconds modeling to accent facial characteristics.

ably the type used by barbers—with the finger rest. Eisner cuts out the base drawing of the face, leaving a tab about two by four inches on each side. Later he folds these face tabs back and glues them onto a piece of heavy cardboard. Thus he rigidly fixes the curve of the paper, and helps to give a lifelike appearance to the caricature

Features that Elsner wants to emphasize are transferred to another sheet of paper from the finished sketch and cut out separately. But before gluing these parts in place, he folds and curves the paper, rolling it over an orange manicure stick to achieve

the right degree of roundness. Then the edges of the features are stuck to the base. Eyebrow tweezers help in handling tiny parts, and sometimes a magnifying glass becomes necessary. Small cardboard props, temporarily slipped under facial parts, keep the features from falling flat while the glue is drying. Finally Eisner paints on the hair and lips with water colors and airbrushes skin tones onto the virtually completed bit of sculpture.

The artist has a good deal of fun in adapting other materials than paper to his caricatures. An automobile taillight pinch-hits



5 The finished self-caricature by Eisner proves that he can take it as well as dish it out. After giving the model a final seissoring, all that is left for him to do is start a libel suit against himself.

At right is Eisner's conception of Henry Ford driving one of his early 1-model cars. The picture below shows how paper sculpture has been used for purely decorative ends. What looks like carving is paper that has been cut out, curved, and glued onto a wooden background. Gift applied by airbrush adds a fancy touck.





for a diamond stickpin, the tip of a shoe tree for a nose, a collar button for a motorcar horn. These are only a few of the amart subterfuges that have helped to make these carlcatures what they are. In one of Joe Louis, a particularly apt touch is the use of table-tennis bails to simulate the prize fighter's buiging shoulder muscles, biceps, and boxing gloves.

Eisner's home workshop is at Woodmere, Long Island, an hour or so distant from New York. He'd better not leave it unlocked when any small boys are around, because it contains the most wonderful collection of junk that a kid could imagine—drawers of toys, bits of yarn and wire, and paper of all sorts and colors. And all of it is grist to the mill.

Branching out from caricature into other fields, Eisner devised a way to make paper look like ornately carved wood, and Fifth Avenue merchants have made use of his work in window displays. He has also made decorations for a debutante's coming-out party, toys and books for children, and miniature buildings done to exact scale.

One of Eisner's window dressings consisted of chairs and other props made entirely of white paper to set off the very latest models of women's dark clothing. It is his firm belief that there are almost unlimited possibilities in the use of flat materials adapted to three-dimensional uses. He gives as examples preliminary studies for sheet metal designs, scale models for architectural use, stage decorations, and television-program settings.



Colorful projects like these are fushioned from cornhusks-a return to an art of our grandmathers day.

Cray Rivork from the Completal



Photographs by WILLIAM W MORRIS

TO OUR pioneer settiers a good coin crop always meant more than food. The husks made into everything from mats for the floors to nullresses for the beds were an a portant part of the harvest. Now that corn is at the height of its season, you may want to try your hand at this craft.

The basks come in layers the later fire and soft the older oarse and strong Coarse basks make a od floor mats and brooms of the mats are fine for table mats basks and prometry and the ake

Inner hasks of mature field coin are almost white when dry and as be died with orderary cloth ites. Boiling is necessary only if they must withstand washing Hasks of sweet corn require drying but they remain green and don't die readily. For interesting cornhusk projects turn to page 119

New Wing Float for a Mariner! The Lift Truck Lends a Hand

THIS handy little motor truck, with its elevator fitting on the front, hoists a new float to be attached under the high wing of a Martin Mariner. One of the mechanics rides up on the open-air lift, ready to make the necessary connections. The longrange Navy patrol bomber is getting its new boot at the Norfolk (Va.) Naval Air Station.

Postwar Plastic Harmonica Has Five Parts Instead of 80

A NEW plastic harmonica, composed of five parts (see photo) as compared with 80 parts in the old-type instrument, makes possible the first large-scale production of harmonicas in America. Invented by Finn H. Magnus and molded from Bakelite polystyrene, the new mouth

organ is sanitary, sturdy, and inexpensive to make. It retains its tone under all climatic conditions.

In the conventional harmonica, the most difficult parts to make are the delicate reeds and the reed plates. The reeds are punch-pressed from flat brass stock and

> hand-ground to size. Then each reed has to be hand-riveted to the plate. In the plastic harmonica, the reed plate is molded in a single operation and contains all the reeds as integral parts of the plate. Complete assembly of the five parts, by "welding" with a hand press, takes only five seconds to accomplish.



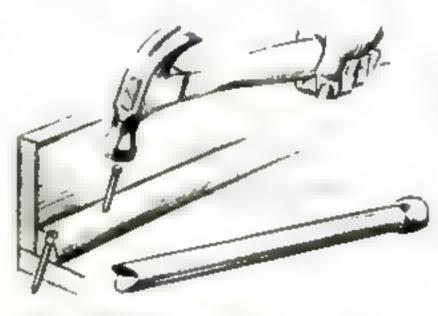
new ideas





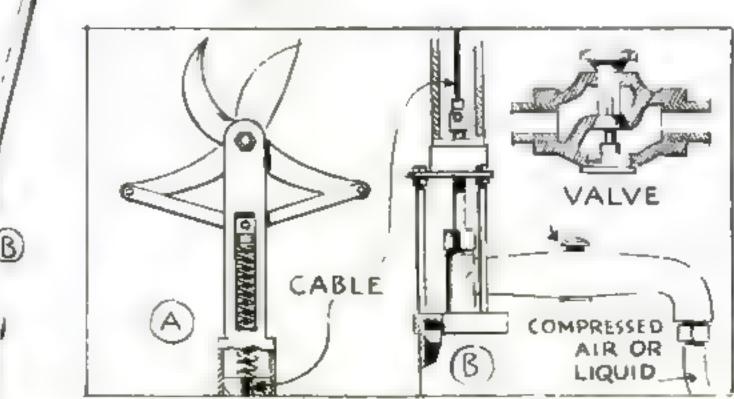
EARRINGS of wood, plastic, and other nonmetallic materials are held comfortably on the ear lobes by a method invented by Cheri Rich, of New York, N. Y. A strip of adhesive tape, threaded under a bar on the inside of each earring, is stuck to the lobe of the car. This climinates the need for a spring clip or acrew to hold the ornament in place.

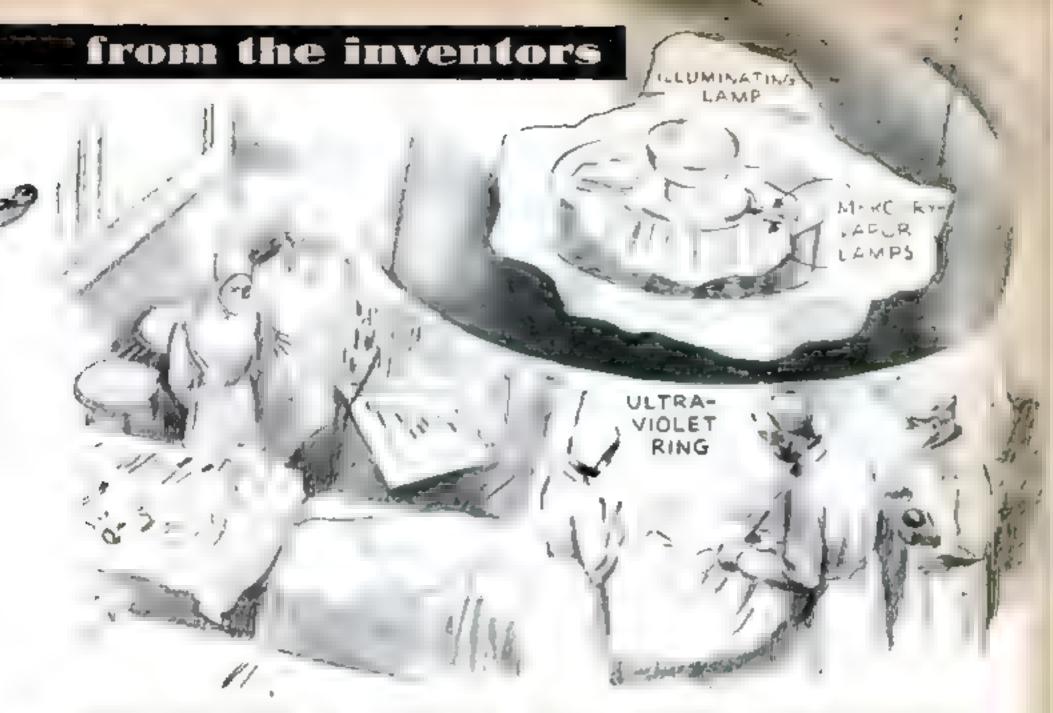




NONSPLITTING NAIL has a V-shaped notch at the end instead of a point. When it is driven into wood, it cuts through the fibers instead of parting them. Inventor is E. J. Gair, Snyder, N. Y.

POWERED PRUNING SHEARS. Compressed air or liquid does all the hard work of tree pruning with these shears, designed by Charles J. Johnson, of Sacramento, Calif. Pressure fed to the tool through a flexible hose pushes down a piston in the butt of the handle. This pulls a cable extending through the hollow pole to bring the blades of the shears together. When the pressure is released, a spring opens the blades for the next cut.

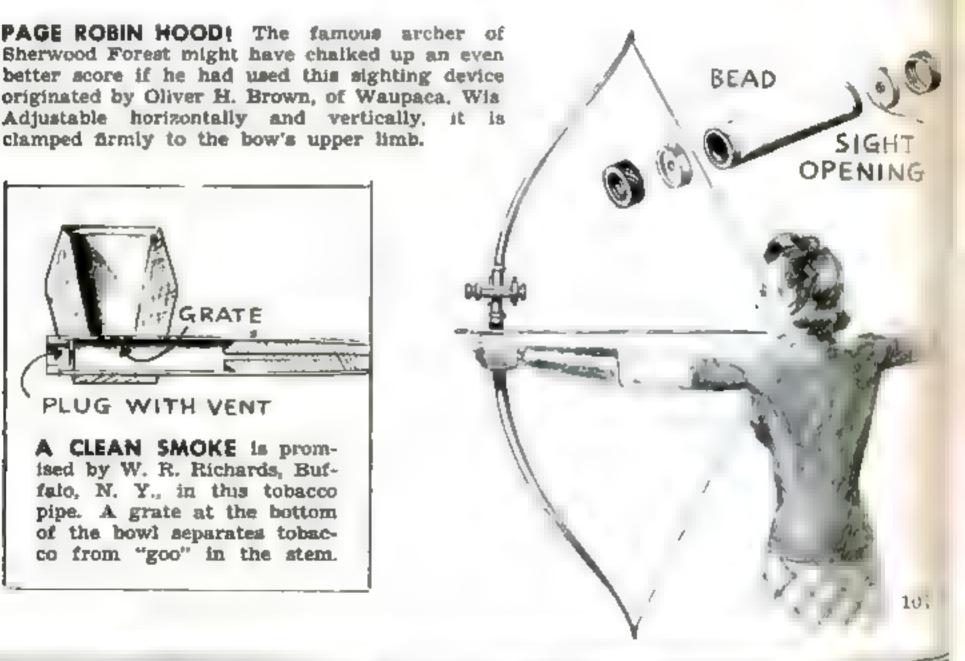




GERMS CAN'T PASS the magic curtain of ultraviolet radiation thrown around an operating table by the lamp shown above. Besides providing light for the surgeon and his assistants, the lamp casts a hollow cone of germ-killing rays around the working area. This prevents infection of

the wound without subjecting the exposed internal tissues to the ultraviolet radiation, which might be harmful if too long continued. The curtain of light is produced by an arrangement of reflecting surfaces. J. W. Kolbert and F. G. A. Haegele, of Blough, England, are the inventors,





POPULAR SCIENCE TAKES YOU INTO A

Cinter I I and working Shop

Tools of 200 Years Ago Create Fine Furniture

Like a page out of a story book, suddenly come to life, is the scene that greets the surprised visitor who enters The Ayscough Shop in restored and reconstructed Williamsburg, Va. Nowhere else in the world, perhaps could one see another cabinetmakers shop like this Workmen wearing knee breeches, white stockings and shoes with silver buckles are bushy engaged in fashioning beautiful articles out of wood and the tools they ply with infinite skill are as ancient as their costumes. They are not permitted in fact, to use any tool or device that was not actually employed when Williamsburg flourished as capital of colonial Virginia.

This is a unique scene in 1945, but there is a reason for it. "That the Future May Learn from the Past," is the motto of Colonial Williamsburg, Inc. the organization that is (Continued on page 110).



of the eighteenth century used the spake shave to produce much of his delicate handwork. The chair being finished here is of the type used by wealthy residents of Williamsburg even long before the Revolutionary War.

Photographs by William W. MORRIS

POPULAR SCIENCE



all handmade and exactly like the tea chests in vague in calonial times is delivered to a "customer" by Joseph Kabelbauer, master cabinet-maker of The Ayscaugh Shap, Mahagary was the favorite wood of early craftsmen.



THE OLD-TIME LATHE, used for turning, grinding, polishing, etc., was made of heavy timbers and other pieces, and was a difficult device to adjust. The tool rest, a strip of iron fastened to sturdy wooden pieces, could be moved only by loosening a wooden wedge, then sliding the assembly into the desired position and tightening the wedge again. Above, the cobinetraker adjusts the piece on which the tool rest is fixed. Balow, he inserts the wedge to secure the piece.



re-creating a whole city that we know only from our history books.

The cabinetmaker was an important man in colonial times. He ranked with the architect. That was the day of Thomas Chippendale, himself a master craftsman of England. The cabinetmakers in colonial Williamsburg turned out furniture that ranked with his. No doubt they used his exquisite designs, as many others of the period did. To see now the crude implements with which these artisans worked is to have greater admiration for the cabinetmakers and their accomplishments, and to prize more highly the few specimens of their handiwork still in existence.

As one enters the Williamsburg cabinet shop, the whole scene gives the feeling of having stepped across the threshold into another world. Dominating the room is a great, wooden wheel, six feet high, with a crank at the hub and a rope belt passing around its rim and over a pulley on a crude wooden lathe. That is the nearest thing to machinery that one sees. The wheel is turned by manpower, and we are told this was usually the task of the apprentice

Hand tools of the period hang on the walls and, like the lathe and its wheel, all are actual relicaof the eighteenth century, gathered from far and wide through months of painstaking search. Their handles have the unmistakable polish given them by the hands of workers long since passed on. With the dust of the years wiped off, they are in use again, turning out things of beauty, to the same designs in fact as in the old days—for only furniture of the colonial period is produced in the shop.

The workbench, too, is one that was used 150 years ago. This was found well preserved in an old barn. Its surface shows many a mark of the tool, and through its top is the hole in which the ancient type of bench clamp fitted, driven down by a hammer to hold the work, or "stuff" as they called it then. One of these clamps also has been recovered and is in use. It works well enough, although it is a far cry from the efficient bench vises of today.



TOOLS FOR WOOD TURNING. Two centuries ago the tools used were not much different from those of today, except that they were cruder and heavier. Calipers were much like those now in use.

Wood-framed saws of great variety are prominent among the hand tools. They were the mainstay of the old-time worker, from the small scroll saw of quaint design to the much larger one used to saw veneers by hand. The scroll saw's blade was tightened by twisting a cord with a stick, that of the veneer saw by driving a wooden wedge that stretched it taut. The hand-saw of today, of course, is not in evidence, but something like it did exist in colonial times. It was a heavy and coarse-toothed saw, rather a tool of the carpenter than of the cabinetmaker.

Joseph Kobelbauer, master cabinetmaker of the present-day Williamsburg shop, is a worthy successor to the colonial artisans, and exhibits the same kind of skill with the tools that they must have possessed. His father and grandfather were cabinetmakers too, and he served his apprenticeship just as did the boys of colonial Williamsburg.

Love of his job shows in Mr. Kobel-bauer's ruddy face as he plies the tools, one after another, on a piece of raw mahogany. Selecting one of the many block planes from a shelf, he shapes a molding along the edge. The planes are numerous, for we must remember that the old-time cabinetmaker (Continued on page 115)

PREFACE.

See no more Reason, why the Sordidness of some Workmen, should be the cause of contempt upon Manual Operations, than that the excellent Invention of a Mill should be dispised, because a bland Florse draws in it. And the the Mechanicks be, by some, accounted synoble and Scandalous? Jet it is very well known, that many Gentlemen in this Nation, of good Rank and high Quality, are conversant in Handy-Works: And other Nations exceed us in numbers of such. How pleasant and healthey this their Diversion is, their Minds and Bodies find; and how Harniless and Flowest, all sober men may judge? That Geometry, Astronomy, Perspective, Musick, Navier chi-

EARLY HANDBOOK of woodworking verified the methods used in The Ayscough Shop. This is the first page of the preface of "Mechanick Exercises," by Joseph Maxon, as published in 1703.

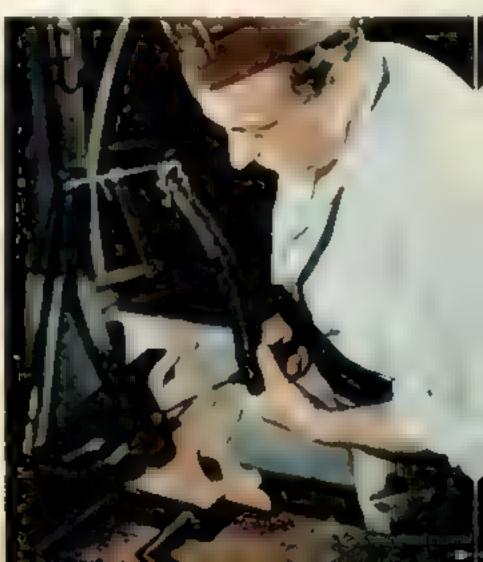
* & C





were of odd shapes and sizes-mostly narrow blades he'd tout by one means or another in rectangular wooden frames. The cabinetmaker of 200 years ago made his own veneers, as above with a crude saw whose blade was tightened by means of a wedge driven through a stat in front of the handle. The pit saw shown in the drawing at the left was so named because in sawing boards from logs, one man would stand in a p t to pull the saw downward while his teammate stood on top of the log to draw it back. The saw used for cutting dadoes (lower left) had half of its teeth raked in one direction and had in the other to permit a push pull operation. The bidde of the double handled scrall saw (below) was strained by twisting the cold with a stick until it was fight







this rathe of which close-up pictures are shown on page 110. The apprentice usually got the job of turning the "great wheel," while the stilled craftsman employed the tools. A rope or other form of belt turns the driving pulley attached to the mondrel. The tailstock spindle of the lathe is adjustable by turning the handle.

The ald maltet seen below plainly shows its years of service. Master cobinet makers made excellent joints and the maltet and chisel were much-used tools. This malet is again seeing service at The Ayscaugh Shop



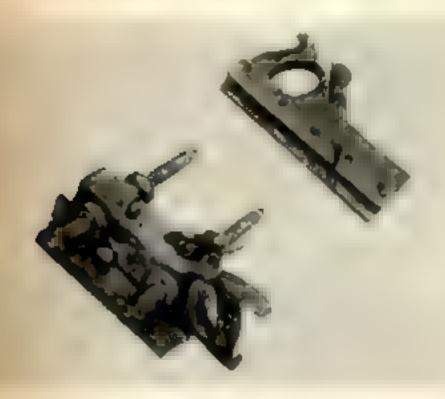
The brace being used below is about 200 years old but at his serviceable. Mode of wood it has brase bindings. Note the bench clamp holding the work. This is the forerunner of the vise





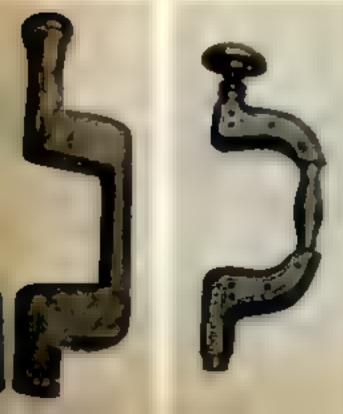


"HOLDFAST." The efficiency of the additine bench clamp as earlied the "holdfast is demanstrated at The Associated Shappin Williams burning Inserted in a hole in the bench it is driven down with a hammer its clamping and holding the wals firmly. The hammer also is of the eighteenth century period



TONGUE AND GROOVE. The upper plane made the langue and the lower one the groove foliable network more than 200 years ago. The latterate known as the plane how has wooden screek for moving the fence hearns to be to ther from the blade so that the sabbet will be sufficiently





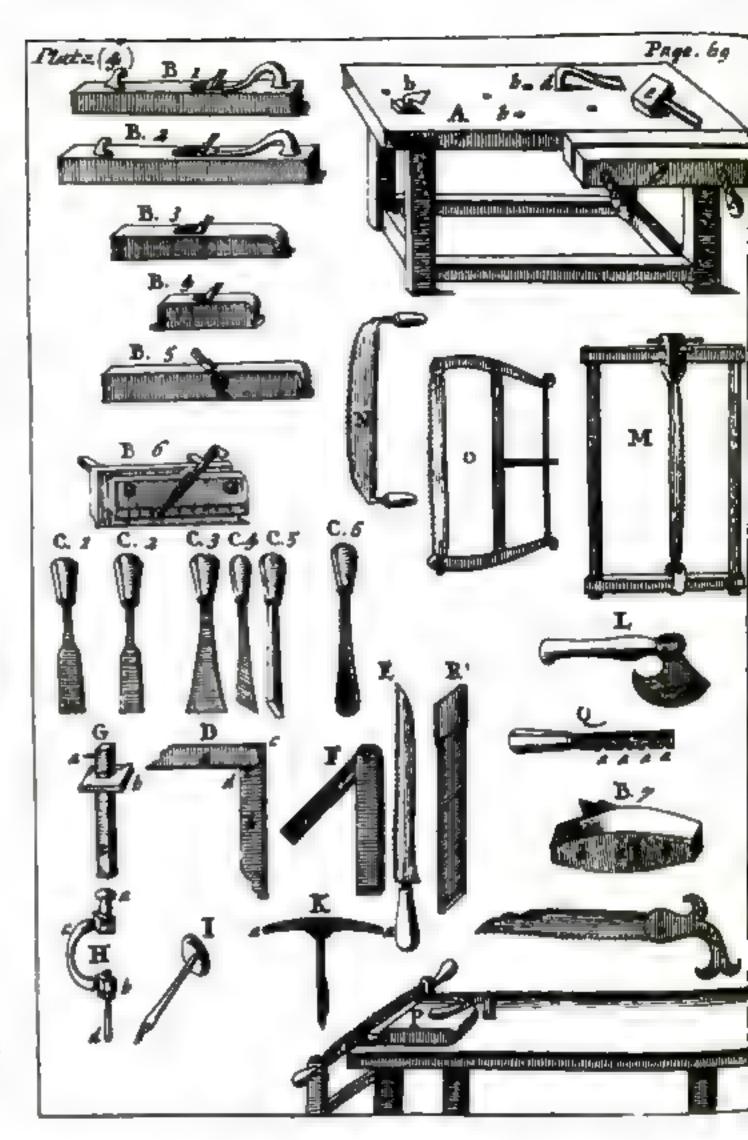


BRACE AND BIT. The air wood brace of the far att dates from the surreenth century and was the only one the colon a cab netwater had until the brass-bound made was evolved. Late in the eighteenth century the stee brace came into existence. The square-shanked bits (above) fit snugly into four squared sockets of the braces. The other tools shown are a carving chiset a dado sow, and a screwdriver.

A PAGE FROM MOXON'S BOOK

- A. Joiner's Beach with bench screw, having (b) catch, (d) holdfost, and (a) mawl (a mollet).
- 8. (1) Fore plane, (2) joynter," [3] strike block, (4) smoothing plane, (5) rabbet plane (6) plow
- C (1 to 5) rhitch and (6) gouge
- D. Try square.
- E Compass sow
- F. Bevel
- G. Gouge.
- H. Brace and bit called olso a "piercer.
- I. Gimblet or wimble
- K. Auger.
- L. Hatchet.
- M. Fit saw
- N. Whipsow
- O. Bow tow.
- P. Saw in clamp for firing
- O, "Sow wrest," for setting saw teeth.
- R. Miter square

Handraw, not lettered, is shown obove the bench in the lower right corner.



from a mill or anything else but rough. hand-sawed lumber. Whatever shape was desired had to be hewed out by hand from beginning to end. And these planes are crude ones, just a block of wood into which the blade must be admisted and fixed by a wooden wedge

The braces and bits are curious when compared with those of today, though they were fairly efficient for their purposes. The braces are of wood, cut roughly to the shape of the modern type. There is a free-turning knob at the top and a

could not order a length of ogee molding square hole at the bottom to receive the bit shank. The grip for the right hand does not turn. This type of brace dates back to the mxteenth century and was all that the colonial cabinetmaker had. About the time when Williamsburg's period of glory ended, 1799, the first steel braces appeared. In the meanwhile, somebody also thought of securing the bit in the brace with a screw. The standard boring bit of the time had no threads on the center pin and no spirals on the shank. It had a blade on one side of the end for cutting around the periphery and one on the other



but the blades had to be tightened by emovable wooden wedges. Above the cap netmotion uses the long trying plane finishing a piece of wood with exactness Below, he manipulates a tiny plane which has a convex sale and is used to form cancave to be a turniture.



for the wigmaker of co lonial times were also products of the cabinetmaker. There is a wig shop in Williamsburg today, and the wooden heads were produced in The Avscaugh Shop



side to dig up the bottom of the hole. Such a bit did not expel the cuttings.

A modern woodworker going into The Ayscough Shop would not have to ask what the various tools are used for, as that is evident in each case. There are counterparts of all modern hand tools—saws, hammers, chisels, miter box, try squares, compasses, awls, and so on—all of them handmade and odd-looking but designed for the same uses as are the tools of today

Mahogany is the wood used in the Williamsburg shop, and this is historically correct, for this was the choice of the master workmen and of their customers during the colonial period. Mahogany was carried back to England from the West Indies about 1725, and the cabinetmakers of the day quickly seized upon it as a wood superior to walnut because of its beauty and also because it lent itself nicely to the claborate carving then in vogue.

According to tradition, Sir Walter Raleigh had one of his ships repaired in Cuba, and the wood used was ma-Queen Elizabeth saw this hogany. wood in the decking of the ship and expressed admiration for its color and Thereupon the gallant smoothness. Sir Walter had some of the planks torn out and commissioned one of the master craftsmen of the time to make a table of it for the queen. Whether or not the story is accurate, it fits into the picture nicely to explain the rapid adoption of this new cabinet wood in England, and also in the British colony of Virginia.

Designs of Chippendale, Sheraton, and Hepplewhite are prominent among the many fine pieces of furniture to be seen in the restored buildings at Williamsburg, the governor's palace and the residences of the nobility. This furniture has been laboriously gathered from many places, every piece selected with extreme care for its authenticity Not all of it was made in this country, of course; the affluent gentry of the time imported much from London. But whether it was made here or there. the influence of Chippendale, Hepplewhite, and Sheraton was so great at the time that it was their designs that went into the finest articles on either side of the ocean.

In the restoration of Williamsburg, which has been financed by John D. Rockefeller, Jr., to the tune of millions of dollars, no labor or money has been spared in the effort to make everything authentic and historically correct. The

ELBOW GREASE and skill were two prominent ingredients that produced the becatiful furniture of the early eighteenth century. Every detail was finished with exactness, intricate carving being effected despite the handicap of crude implements. Mr. Kobelbauer, gives an oll finish to a clock cabinet with the same care practiced by his colonial predecessors. The ancient craftsman turned out finished products comparable with the finest that our modern tools and machinery can manufacture.



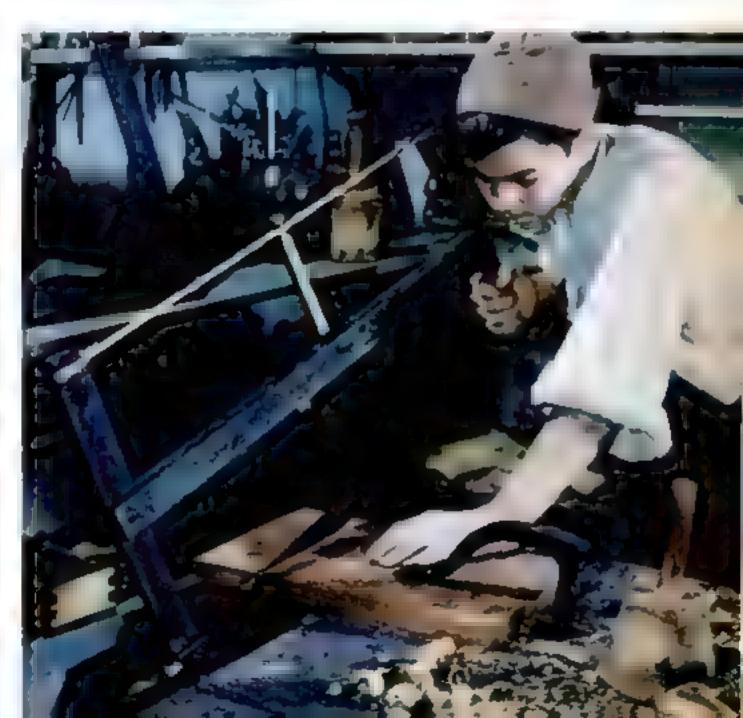
research department did a prodigious job of investigation and examination of tools so that whatever was put into the cabinetmaker's shop would belong to the period.

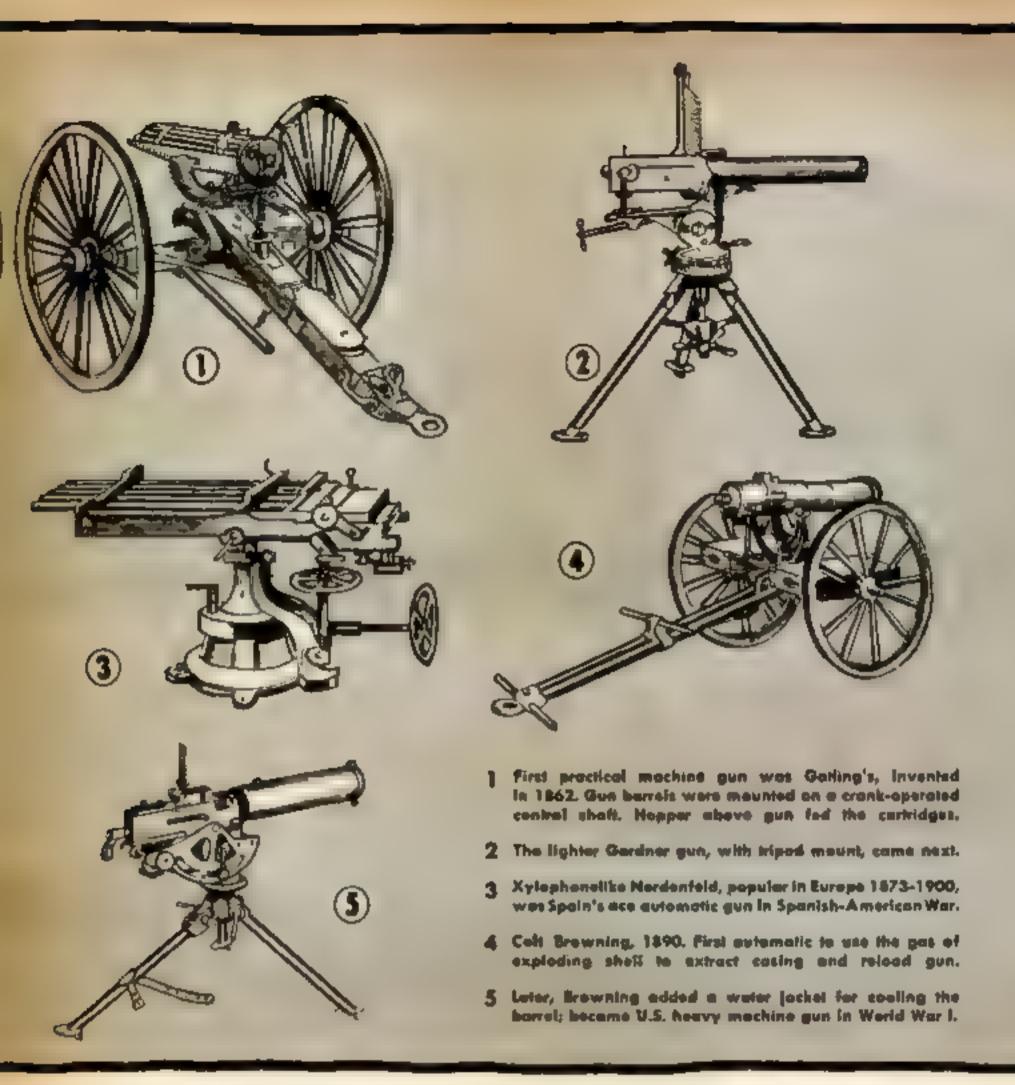
Williamsburg was the colonial capital of Virginia from 1699 to 1779. During those 80 years it was the social, cultural, and governmental center of a vast area, but after the government moved away it declined and was almost forgotten until 1927, when the restoration project was started.

Since the cabinetmaker of that time was such an important craftsman, producing as he did the fine furnishings for the homes of the wealthy and most influential, it was fitting that restored Williamsburg should have a suitably equipped shop of this kind.

—GOLD V. SANDERS.

APPRENTICE liamsburg boy, dressed in typical sostume of the early Williamsburg days, uses the bulky backsaw in cutting a piece of mahagony. The apprentice did the rough work until he could acquire the skill that could come only after many years of service under the guidance of a master cabinetmaker. In many cases the sons of woodworking craftsmen were brought into the shops to observe and to moster the family trade.





Machine Guns...from

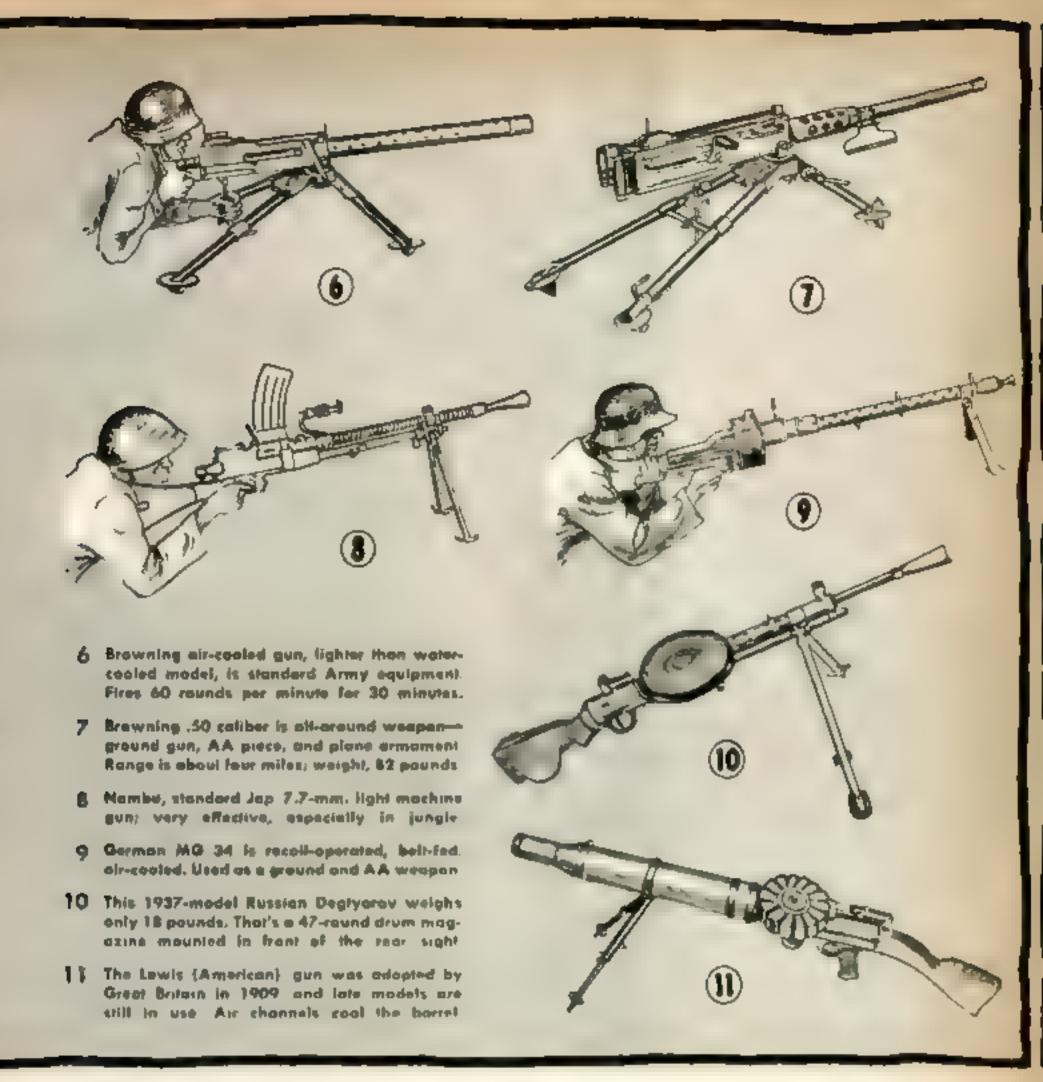
By Lt. J. T. HOLMES, AUS

Drawings by JAN HOLMES

STRANGELY enough, the American who invented the first practical machine gun, like the inventor of dynamite, hated war and hoped his invention would bring an end to all wars.

That man was Dr. Richard Jordan Gatling, born September 12, 1818. Unfortunately, the doctor's dream, born of the hortors he witnessed on Civil War battlefields was not to be realized. He envisioned a world held from war through terror of his death-dealing, rapid-fire gun. Instead, the machine gun became just another instrument for dealing out mass death. But, as with every development of war, a countermeasure was found—in this instance the tank, which broke the stalemate of trench warfare of 1916-18.

Gatling patented his invention in 1862 and offered it to the Federal Government, but it was viewed with suspicion. Undiscouraged even by a fire which destroyed his experimental work, Gatling hired men to take



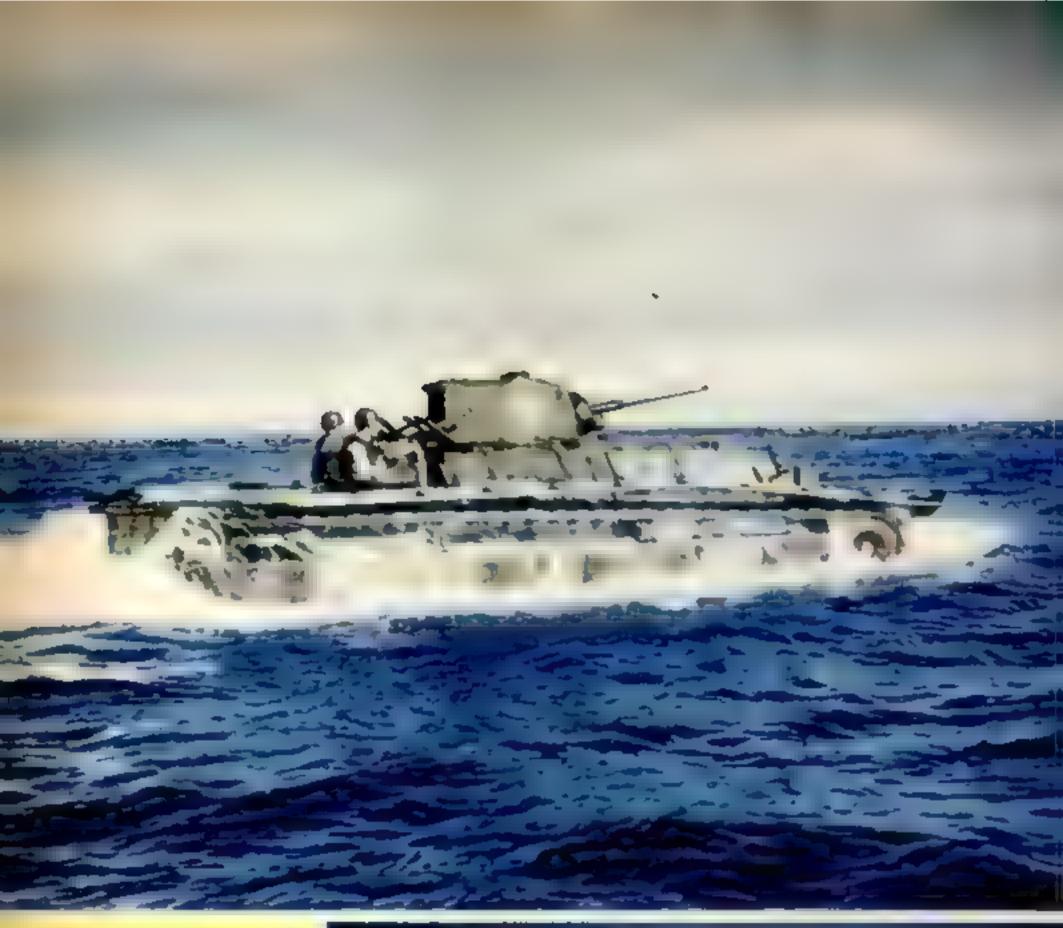
Gatling to Browning

the weapons out on CAL Was but chebis and denonstrate their use to the model tary men. In the cash, years of the was General Butler used the gan and rest Can federate infantry in an ongress of the James River in Virginia. At approve model of Gatling's original design was a lopted as the standard machine, an of the United States Army in the early 18 0 s.

While Gathing was working or his weapon, the mitrailleuse another form of machine gun was being developed a Papa sets. Pagain This abines a part was

war of 1870 with very poor results. The Prussians, who had a few machine guns of their own, were greatly impressed by the possibilities of automatic weapons but discarded the mitrailleuse for the Palmérantz-Nordenfeld and several other models

Chronologically, the Gardner, invented by an American, followed the Gathing gun Gardner was years ahead of his time in the design of the tripod stand and the lightness of his weapon, which was widely copied by European arms (Continued on page 208)



GOING ASHORE, an LVT(A) I amphibian churns the blue waters with its whirling treads as it heads for the beach. Its 37-mm. cannon is ready to fire at enemy pill-baxes, and the two machine guns are manned. Its low sil houstte makes a poor target

ON THE BEACH, the shipper and his assistant come up
for a look around. The two
machine gunners are on the
watch for enemy planes. Radio
maintains constant contact
with forces ahead and behind
(Note aerial in upper photograph.) Tracked landing vehicles of this type first saw
action at Kwajolein on Febru
ary 1, 1944. A later mode is
graped with the 75 mm cannon



120 POPULAR SCIENCE

MEET THE LVT'S

Beach Busters

Because they can run in water, sand, or jungle, they are leading the way in the march on Tokyo.

By ALDEN P. ARMAGNAC

"THERE is not the slightest shadow of doubt that the overwhelming victories of our forces at Tarawa, Kwajalem, Saipan, Tinian, Guam, Palau, and Iroo Jima would not have been possible without the Amtracs."—Vice Adm. E. L. Cochrane, U. S. Navy Bureau of Ships.

AT OKINAWA, the newest members of America's growing family of Amtrace waddled ashore, toted cargoes up the hills

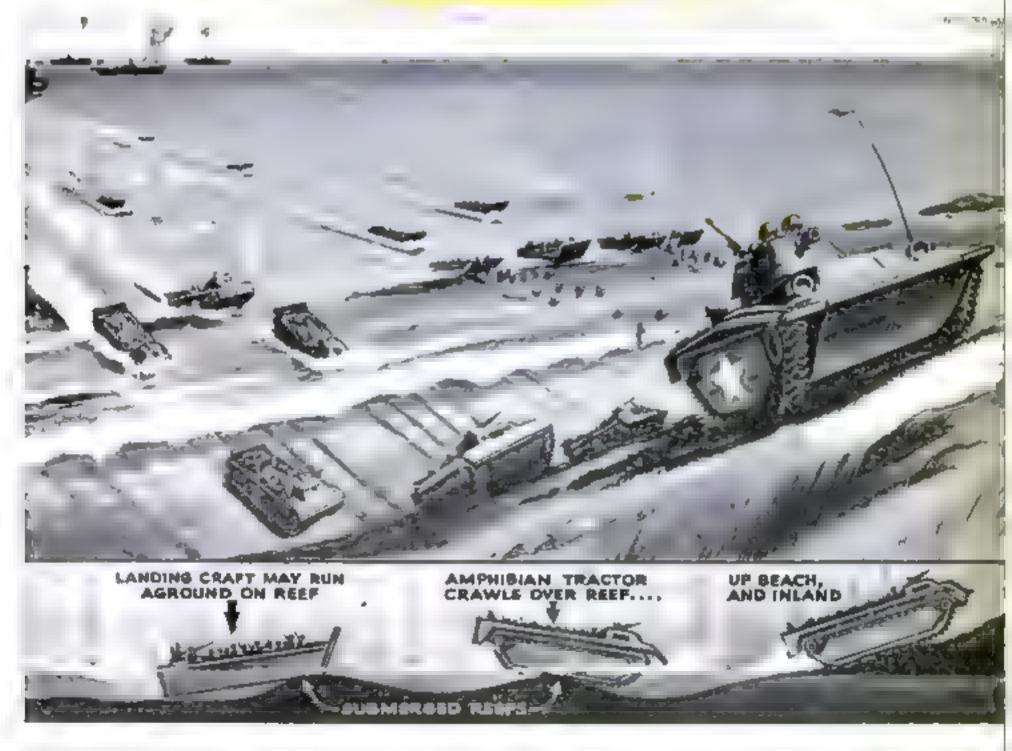
to the front line, and hauled back the wounded men. So censorship now has been lifted sufficiently to permit you to know about our newest amphibian tractors.

Like the Alligator and the Water Buffalo, these new Amtraca are officially LVT's (Landing Vehicles, Tracked). They have neither wheels nor propellers, but travel over land or water by using their endless tracks as ground grippers on terra firms and as paddles in the sea.

They are descendants of a "rescue tank" invented a dozen years ago by Donaid

AMTRACS CRAWL OVER REEFS THAT STOP REGULAR LANDING CRAFT

At Okinawa, the Japs counted on false beaches and underwater reefs to halt invaders offshore. They had not figured on our amphibian tractors, which can climb over such obstacles. What is more, these cargo, troop, and gun carriers don't stop at the beach, but crowl ashare and go after the enemy over the roughest terrain.



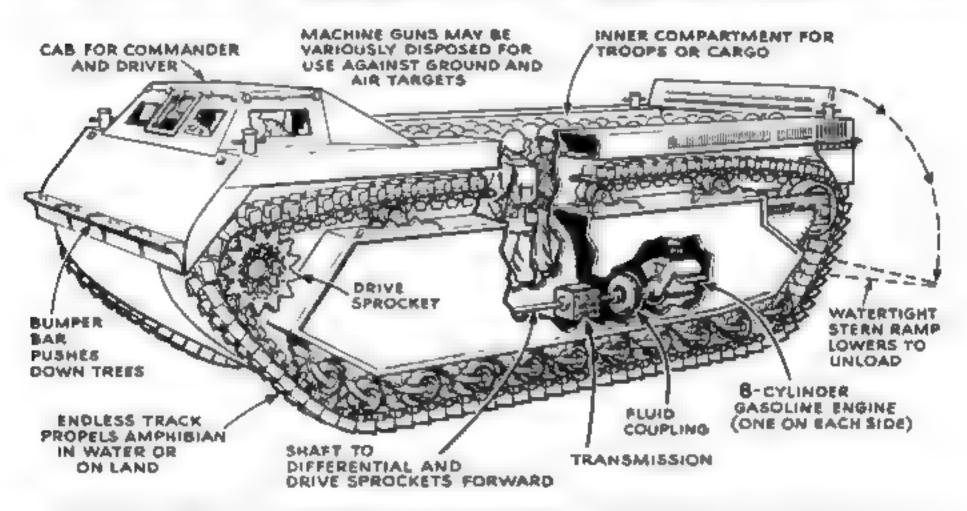
Roebling, grandson of the famous bridge builder, to save persons marooned in the Florida Everglades by tropical hurricanes. Navy and Marine Corps experts saw news pictures of Roebling's machine (P.S.M., Jan. '36, p. 42), and ordered a couple of aluminum pilot models. Few persons suspected then that Roebling's invention would help to shorten bombers' flights to Tokyo in 1945, but that's exactly what his machine's descendants have done. They've now swum and rolled to within 350 miles of Japan.

If you want to be technically correct, don't speak of an LVT as an "amphibian tank"—especially if you are talking with a certain Marine Corps officer who had three shot out from under him in a single engagement. The ones that carry troops or cargo

are "amphibian tractors," or Amtraca for short, and their thin plating stops nothing heavier than small-arms or light machinegun fire. Therefore, their attack often is led by one or two waves of armored amphibians, a later class with more protection.

Typical armament for an amphibian tractor consists of four machine guns—either two .50's and two .30's, or all .50's. The choice depends upon a nicety of tactics. Where aerial opposition is expected, the .50 caliber weapon serves as an antiaircraft gun and is used throughout. But when Allied airpower neutralizes the enemy's, .30 caliber builets kill Japs on the ground just as effectively, and more ammunition can be stowed aboard. Armored amphibians mount both machine guns and comparatively heavy weapons—a 37-mm. gun or a 75-mm.

HERE ARE SIX MEMBERS OF THE GROWING AMTRAC FAMILY



CUTAWAY VIEW of the LVT(3) Bushmaster shows fluid drive that makes this model easier to handle.

LVT (1), the famous Alligator, was developed from a hurricone-rescue vehicle. Many of these pioneer amphibian tractors are still in use.

LVT (2). Amtracs gained new size and power in the Water Buffalo, which first sow action at Baugain-ville in 1943. It is 26 feet long, weight 14 tons.





howitzer—and start firing from the water as soon as the preliminary barrage from

major warships has lifted.

Fuel tanks filled with high-test gasoline, invasion-bound LVT's take to the water from the lowered bow of an LST—the Navy's versatile ocean-going vessel named for its original use as a Landing Ship, Tank. By way of comparison, it takes 31, minutes to unload 17 LVT's from an LST, 25 to 90 minutes to unload a single LVT from a larger ship.

Taking radio orders from their group commanders, the amphibians first jockey into place on the "line of departure"—a standard assault formation, resembling that of race horses at the barrier. A second command, and they're off. Don't expect them to show spectacular speed, for they're work

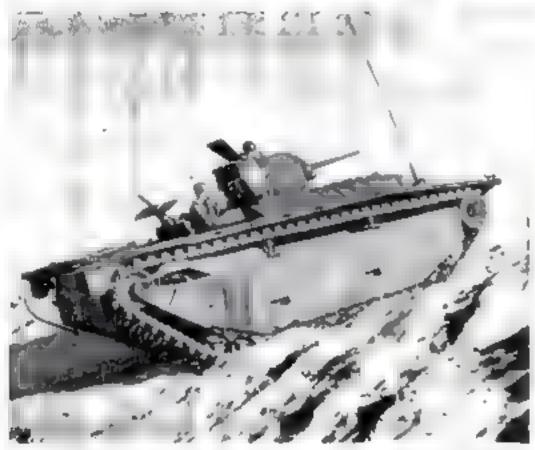
horses rather than sprinters, with a pace of four or five knots in the water.

As an Amtrac nears a hostile shore, the spang of bullets against its side warns occupants not to risk a peek at what is going on, but to crouch in safety. Usually an observer in a protected position volunteers a running account of the situation.

Given sufficient notice where to land, the driver stars in the climax of the show. It is up to him to beach the machine through heavy surf, if necessary, and thorough training has taught him just how to do it Above all, he must never let a wave catch him abeam True, LVT's have power pumps that discharge water normally shipped aboard—but, for all their virtues, Amtracs are not submarines.

A grating noise announces that the LVT

EACH DESIGNED TO DO A SPECIFIC INVASION JOB



LVT (A) (1) was our first armored amphibian. Built exclusively for fighting, this 18-ton vehicle looks like a seagoing tank with its turnet mounting a 37-mm, gun. Its crew of six men is protected by relatively heavy armor.

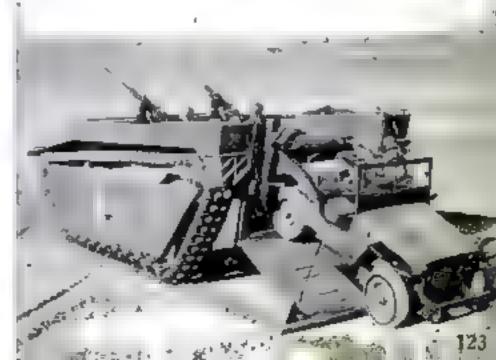


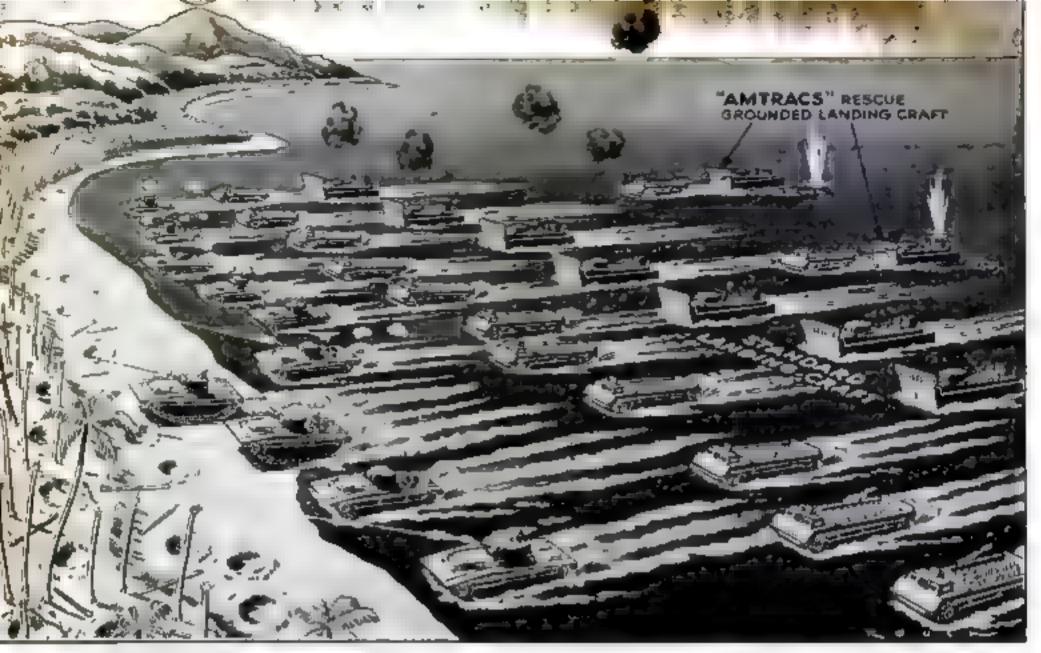
LVT (A) (4), the latest armored model, has a 75-mm, howitzer that can lob shells over coostal ridges. A 20-tonner, it is handled by five men. Its debut was a surprise to the Japs at Saipan.

LVT (3), the Bushmaster, was kept under wraps until Okinawa. Its autstanding new feature is the fluid drive that takes it up hills with little shifting of gears.

LVT (4) introduced the rear ramp, a great help in unloading under fire. Twenty-six feet long, it carries 45 men, a jeep, or a fieldpiece with crew.







INVASION TACTICS usually call for one or two waves of armored amphibians to lead the way, followed by Amtracs loaded with men and supplies. When regular landing craft get stuck an reefs, the amphibians tow them off. Men in the open-top Amtracs crouch low for protection behind the steel walls, with observers in shielded positions telling them what goes on. Pennants on radio antennas identify group commanders' vehicles. All the other Amtracs fly pennants, too, and only our men know which kind marks the leader. If the Japs get wise to the code, it can be changed quickly while the fight goes on,

has reached shore, and, dripping brine, it goes into action in its terrestrial element. Incidentally, the design of its double-purpose track cleats deserves more than a passing glance; shaped like the blades of a Pelton water wheel, they have applied a classic hydraulic principle in reverse, for aquatic propulsion. Like the tracks of a land tank, they are used for steering, both afloat and ashore. To turn, the driver runs one track faster than the other; to face about, he operates them in reverse directions.

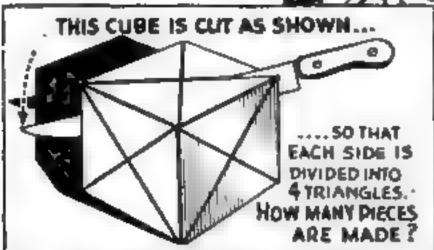
On land, the 20-mile-an-hour speed of an LVT cannot compete with that of a tank. Where it scores again is in its incomparable ability to overcome every variety of difficult terrain. Marines struck a curious type on the beach of Iwo

NO SUPERHIGHWAYS are needed by these first-rate jungle machines. Mud, trees, or volcanic sand con't stop them. The "duck" truck, a wheeled amphibian, could never get over terrain like this, but Amtracs take men and supplies inland and bring out the wounded.

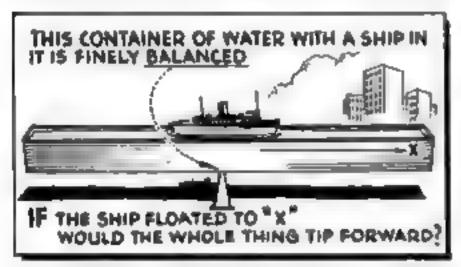
Jima—volcanic sand, so soft and yielding that they might as well have been struggling through a quagmire. But their amphibian tractors rode over it with ease. Likewise, as at Bougainville, tropical rains that turn roadways into beds of thick mud cannot stop them. During the Cape Gloucester invasion of New Britain, our troops received supplies in LVT's over no roads at all. Marines consider them tops among jungle machines. They have enough power to crash through the toughest thickets, and to run up hills too (Continued on page 806)



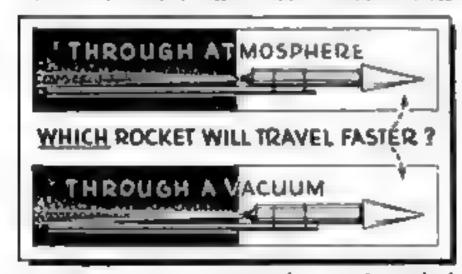
Hows



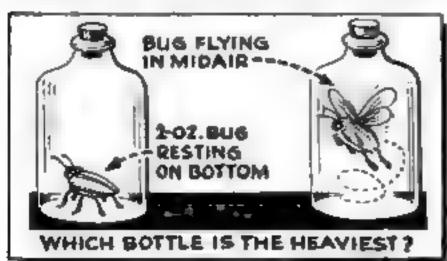
Since oil cuts meet in the center of the cube, there ore four pieces for each of the six sides—24 pieces,



Ship's pasition would not attect balance, because its vesight is displaced and distributed throughout tank,



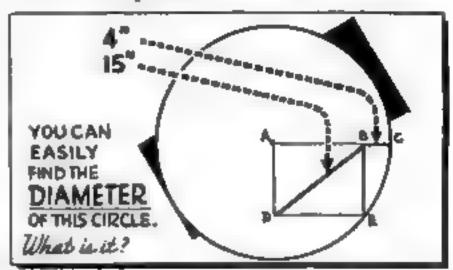
Recket in vocuum travels fester. Air doesn't help jet propulsion; its only effect is to effect resistance.



With equal amounts of air, the bottles wasten. The flying bug's weight is little in the bottle.

Your I.Q.?

DON'T LOOK NOW, but after you have tried to solve these problems, turn the page upside down and read the correct answer under each picture.



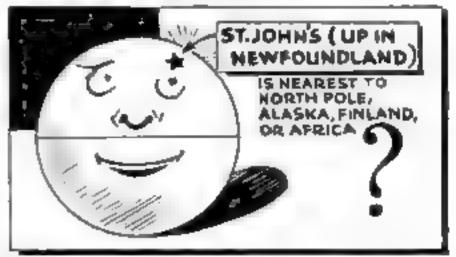
The distance AE, which is a radius of the circle, is equal to 80, at 15 inches. So, diameter is 30 inches.



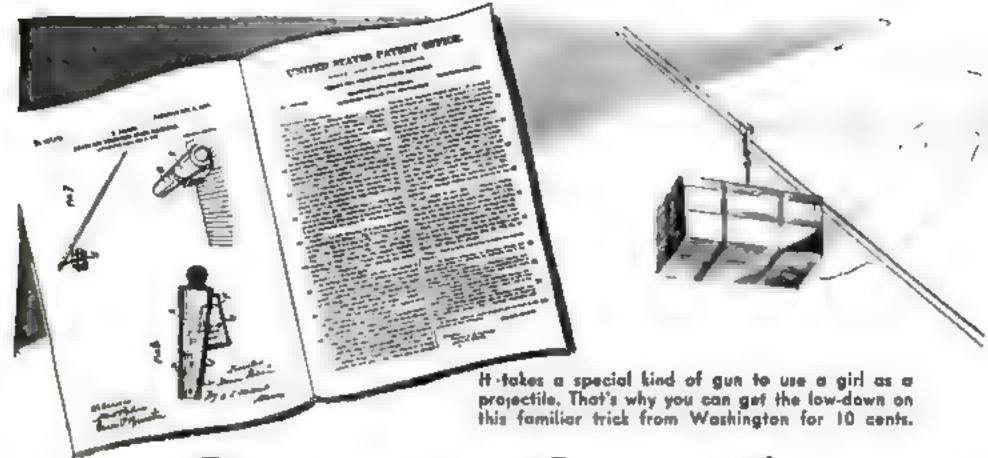
New deliter bills stock 233 to the inch. In one pile, e billion would reach 66 miles, in six piles, 11 miles.



Sure, it can be done. Smaller window has a diagonal of two feet and bottom.



Africa, in the region of Morocco, is closest by a long way. Check on this with a globe and dividers.



Patents Give Away Magicians' Secrets

MYSTERY IS STRIPPED FROM STAGE ILLUSIONS BY PAPERS PROTECTING IMPROVED APPARATUS. YOU CAN DUPLICATE SOME OF THESE STUNTS.

By MICHEL NOSTRADAMUS

(Pen name of one of America's leading omateur magicions)

NLESS people ask the question, "How does he do it?" there isn't much point in an exhibition of magic. They go to the show to be mystified, and come away slightly irritated because they are mystified.

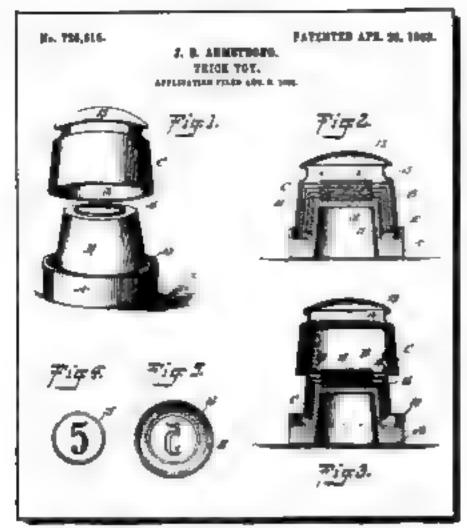
It's easy to find out how any trick is done if the apparatus has been patented in the United States. For a dime you can get any one of the papers issued by the U.S. Patent Office and figure out how the magician saws a lady into two pieces, causes a skeleton to appear in an empty cabinet, or loads a girl into a cannon and shoots her into a nest of three locked trunks hanging by a cable up near the roof.

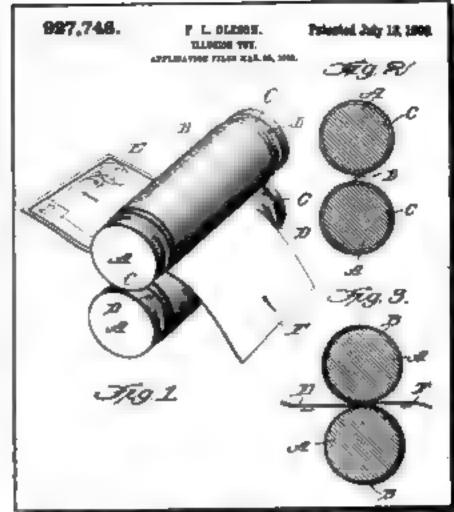
Uncle Sam tells all; and since many of the big-time illusions are based on apparatus patented 17 or more years ago, you are at liberty to go ahead and reproduce these if you have the skill to build the equipment and learn the routines. The Patent Office, custodian of these secrets, lists "Illusions" under Classification 272, subclassification 8; and there are other subheads covering various smaller appliances of similar kinds.

The chances are that the tricks are not new—and weren't when the patents were issued. In each case it was an improvement on the apparatus that was patented. The first important stage illusion on which a patent was granted was devised in England in 1863 by a Professor Pepper, of London's Polytechnic Institute, and was known as "Pepper's Ghost." It required a huge sheet of glass inclined forward on the stage at such an angle that it would reflect an illuminated pit or lower stage. Actors appeared behind the glass, which was invisible to spectators, and other actors representing ghosts or skeletons took their places on the hidden stage in front of and below the glass. Turning on the pit lights produced the intended result, which was, in the quaint phraseology of patent papers, "to associate on the same stage a phantom or phantoms with a living actor or actors so that the two may act in concert."

The Professor patented his "Metempsychosis" in the United States (No. 221,605) in 1879. In this illusion, miraculous transformations took place with the aid of a mirror set at an angle. One of its many







MINT YOUR OWN, Just put a blank metal disk in this stamper and hit the cover a blow. Then lift the lid and you'll find a real U.S. coin; that is, if you have previously loaded nested section with a dime or a cent or whatever is to be "made."

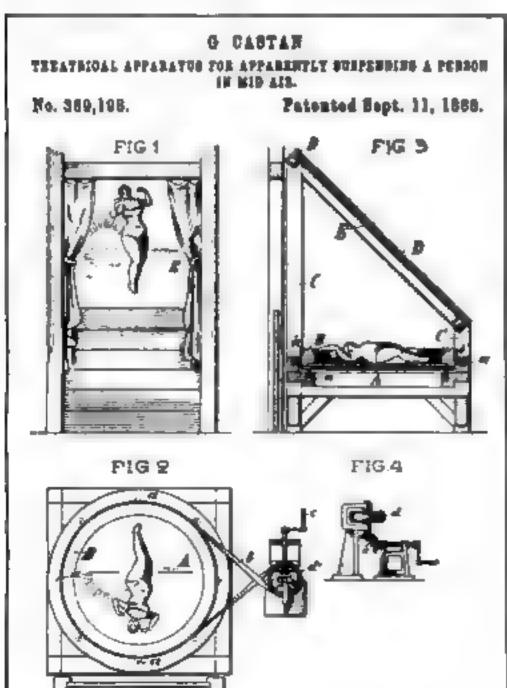
MACHINE TURNS OUT DOLLARS. The dollars are real, too—placed so that they will issue as blank sheets of paper are fed between rollers and go out of sight inside of the trick device. You roll out "dough" while cylinder's supply lasts.

"AMPHITRITE THE SEA NYMPH" rises from the water and seems to twist and turn in midair. The patent drawings, made over half a century ago, reveal that she is lying on a revolving turntable and reflected in a slanting mirror seem by the spectators. Apparatus for the illusion was adapted from an earlier one by a London professor.

adaptations was "Amphitrite the Sea Nymph," the patent drawings for which are shown on this page. Drawn-back curtains disclose a marine for the illusion rine scene, in which a beautiful young goddess of the sea rises out of the water, performs graceful inotions in the air, and finally sinks beneath the waves.

Of the various devices loosely classified under the head of "Pepper's Ghost," the best for miniature construction is the transformation of a dummy into a skeleton, both of which can be doll-size. For this, get a square box with an open front and provide a sheet of glass to run at a 45-degree angle from front to back. You supply lights at the top of the box both in front and back of the glass. Governed by a two-point switch, one set of lights can be alternated with the other so that in one case the glass is transparent, and in the other it becomes a reflector. Behind the glass is the doll, while facing from the side of the box is the skeleton. Switching the lights seemingly transforms one into the other at the will of the operator.

Use of a double-pointed rheostat will produce a dissolving change. In any case, the skeleton must be hidden from normal view and the light-





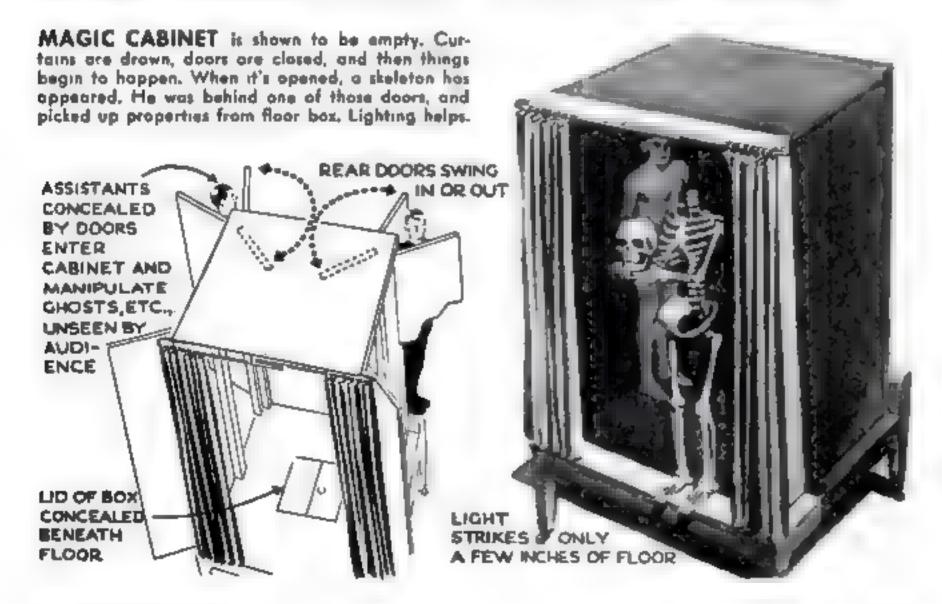
LOWER BOX AFTER SAWING.

AND FRONT ASSISTANT
REPLACES LEGS THROUGH

LEG HOLES

ing made indirect. This is done by closing the front of the box except for an upright aperture like a door that comes a trifle higher than the doll's head. As exhibited lifesize in side shows, the two figures are often incased in upright open coffins.

Aided by the revelations of the Patent Office, you can reproduce such whimsical little gadgets as the breakaway fan, which spreads normally when opened in one direction and practically disintegrates if pulled the other way. You can construct a machine that will turn out coin of the realm when you feed it blank metal disks, or one that will produce a crisp, spendable bill when you roll in a sheet of white paper.



383 PRUETH AVENUE - WEW YORK 10,16.7.

Suggest a letter to
Ca a from editors ©
based on experiences
in Air Vacation
—D. G.F.

The Administrator of Civil Aeronautics, Washington 25, D. C.

Dear Sir:

In the interest of more and safer flying in privately owned siroraft after the war, POPULAR SCIENCE MONTHLY has just completed a project unique in aviation journalism.

To discover what was right - and what was wrong with the nation's approach to the problems of private flying, we dispatched two men on a trip of almost 5,500 miles in a light airplane. These men are experienced pilots of small planes, yet they encountered enough difficulties to give pause to those who talk in terms of a half million or e million private planes within a decade after the war ends.

The story of their trip began in the August issue. It is concluded in this issue.

In the years of peace to come, better planes and more landing fields will be needed if the airplane is to take its place in our transportation system as a vehicle of personal utility. But more than that is indicated. We should like to make the following recommendations:

Better navigational aids on the ground, ensity visible from the air, are imperative.

No field ontering to the private pilot should be marked on aeronautical maps unless it is properly maintained and readily identifiable from the air.

A means should be found for posting the periodic weather sequences at all personal-flying fields. The safety of all air traffic may ultimately necessitate grounding planes flying by contact when their pilots propose to venture into bad-weather areas,

These are our findings, submitted in a spirit of cooperation to the end that personal flying may attain the stature it deserves.

The Stators

THE FLIGHT ROUTE, like many other things about the trip, was finally decided by the weather. Francis and Groenhoff had planned to return from Denver to New York by way of Nebroska and lowa, but they found that the best-laid plans of air tourists are subject to change by the whims of winds and clouds,





POPULAR SCIENCE Takes You on

A Flying Vacation

3,430-MILE JAUNT COST UNDER FOUR CENTS A MILE

By DEVON FRANCIS

Photographs by HANS GROENHOFF

AT THE Goodland, Kan., airport, as we voyaged westward on our lightplane vacation, the meteorologist had warned us of impending thunderstorms. And now, bent on reaching Denver before nightfall, we had become lost over the Colorado plains country.

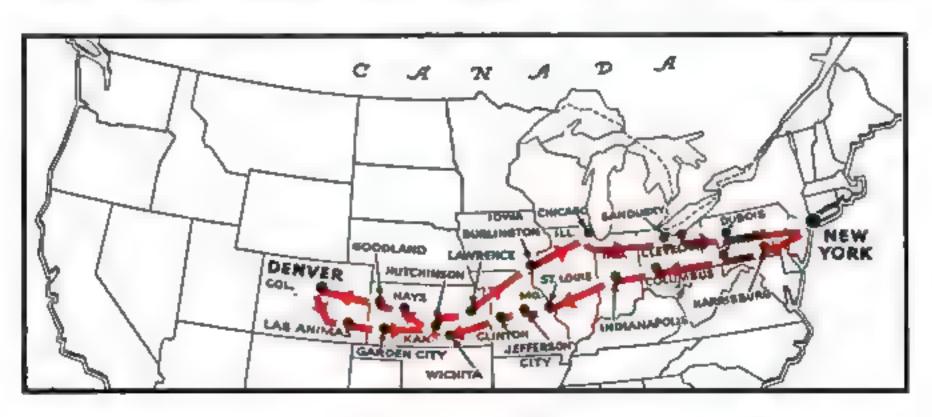
That had been the melancholy result of flying off course to dodge a storm.

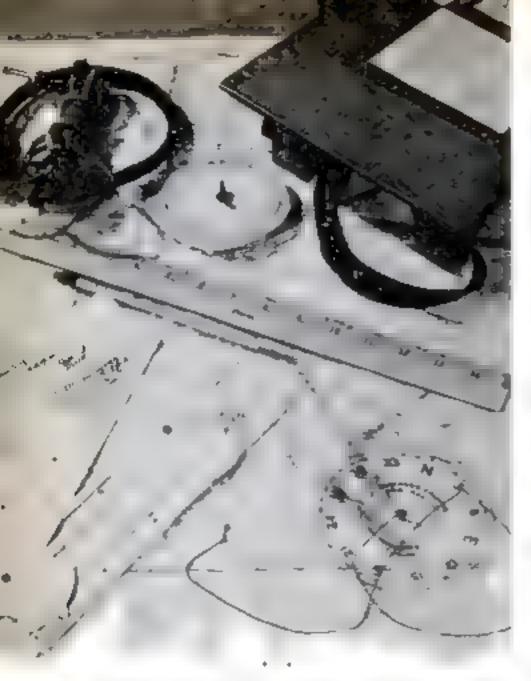
"We aren't exactly lost," I remarked cheerfully to Hans Groenboff, photographer and copilot. "We just don't know where we are."

Even with our rudimentary knowledge of weather, we knew we had to keep clear of that storm. Luckily enough, it was the first one we had met in our more than 1,500 miles of flying from New York. We knew that inside it were winds of hurricane force. Even several miles away from it the air was choppy. The plane was pitching

"If it will make you any happier," said

PART 2 Groenhoff, "look."
He pointed off in the direction op-





FLYING AIDS used in piloting the Aeronca Chief included a navigational computer, ruler, pencil, protractor, flight-record slip, airman's map, another protractor with reciprocal readings for quick compass arientation, earphones for the radio receiver, and a Francis-designed kneeboard that is strapped to the leg to keep maps in view.

posite to the storm we were skirting. There sat a pile of purple-black clouds with a narrow ribbon of dirty gray at their base. If we were to miss this second storm, we would have to alter course again. We did. Then we spotted a third storm. In several years of flying I had never encountered anything like this. It took us fully an hour to maneuver our way into the clear.

"I think we're off the map," said Groenhoff, "We must be somewhere in Wyoming." "No, we're not," I replied. "Look ahead

of you."

I used to live in Colorado. Some snow-crested peaks spired up on the horizon. They looked familiar. We rechecked our position. After all our wandering around we were 30 miles northeast of Denver, practically on course. Another thunder-storm crowned the city as we neared it, so we cruised around on the outskirts until the air cleared.

That night we celebrated.

"A nice tenderloin steak," I told the waitress at dinner. It was small talk. We knew there were no steaks,

"I'm sorry," she replied. "There's no ten-

derloin but I can give you a sirloin." It took me five minutes to bring Groenhoff out of a dead faint.

We vacationed. We fished in a mountain lake. We did some rubbernecking from the air. We lay on our backs in the sun. And before we knew it days had gone by. It was time to start home. We checked the weather. A cold mass of Canadian air was moving down from the north and spreading across the northwestern United States.

"I'd wait," said the Denver weather man.
"if I were you,"

We waited. We had to. We wanted to cut northeast to Chicago. "Cellings" were coming down all over that area. After 24 hours we got impatient.

"Let's leave," said Groenhoff. "We can cut south of our course." I was as anxious

as he was to get away.

We had broken our rule again about avoiding major air terminals, because Denver Municipal Airport was the only place we could find hangar space. Now, as we sat on the concrete apron abutting the hangar, gassed up and ready to go, the control tower grew curious.

"The ceilings are down east of here," it told Greenhoff by radio. "Where are you

going?"

"We'll check in at Hugo," said Groenhoff into the transmitter, naming a town 90 miles southeast of Denver.

That was just close enough to the truth not to be a fib. We would land at Hugo if we had to. The control tower had no suthority to keep us aground so long as the ceiling and visibility were all right at Denver. It was just trying to be helpful. In turn, we didn't want to be a worry to anybody. We only wanted to get away.

Twenty minutes out of Denver we hit it. Fog stood like a wall from ground to sky We turned southeast. The fog stood spreadlegged in our path. We turned south. Here it was clearer. But the terrain was coming up.

"Want to go back?" asked Groenhoff.

This was the very area, east of Colorado Springs, that a Civil Air Patrol captain in Wichita had told us to shun. The hills were almost too high for us to clear them with the horsepower at our command. A 7,000-foot ridge swept by, barely 200 feet beneath us. The Aeronca, heavily laden and taxed almost beyond its capabilities, was reassuringly steady

"I don't like this," remarked my com-

panion. He was sweating.

"For me," I said, "you are understating the case."

We were lost again, but that was a secondary consideration. Our job was to keep



LANDMARKS are the guiding stars of the flyer who navigates by "pilotoge." Same stick out the same thumbs—for example the rail yards at Wichita, Kan., (abave) with an elevator and round-house standing out unmistakably. The oil field at right presents a characteristic pattern. To help 'contact' flyers. Coast and Geodetic Survey maps prepared for airmen are filled with pictures and symbols like those shown below, identifying easily seen objects on the ground. Nate that cities with more than 5.000 population are indicated by outlines representing the actual shape of the built-up area. If you follow a tailroad, you must watch out that you don't get switched to the wrong track.



HOW PROMINENT LANDMARKS ARE SHOWN ON AN AIR MAP

Cities and Towns Race Track Less then 1000 1000 to 5000 Forest Ranger Station More than 5000 (actual shape) Quarry or Mine **Highways and Railroads** Coast Guard Station Prominent Highways -- Secondary Highways Lookaut Tower → Reilroad (one track) Oil Well



HELPING HANDS were extended almost everywhere, both by airfield personnel and by the local flyers. Here David M. Brown, the chief pilot for Mountain States Aviation, Inc., at Boulder, Colo., is helping the Popular Science flyers to patch a tire that had gone flat in landing. One hospitable airport operator even took Francis and Graenhoff out for a sightseeing trip in his own automobile.

AIRPORTS that could be seen and identified easily from the air were at a premium. One of the best was Norton Field, at Columbus, Ohio (below). Many of the small fields were so effectively concuflaged that our flyers had to give up after a fruitless search and go on to another. Government fields are uniformly well marked and maintained. Private airports often are poorly marked because the owners just aren't Interested in transients.

out of the fog and find lower ground. We knew the Arkansas river lay south of us, and on that we could orient ourselves.

The hills got lower. Then the river, silvered by a shaft of sunlight, appeared ahead of us.

"Maybe that radio will work," said Groenhoff. He fingered the dial, listening hard at the earphones.

"I'm getting the 'N' signal on the La Junta frequency," he announced. He put a finger on the map. "We're about here."

After more than 1,700 miles the fact that the radio would pick up the beam signals was a pleasant discovery. It was sheer tdiocy not to have tried it out before. We turned east, landed at Las Animas, Colo., refueled, and hurried on to make up time.

Weather forced us to put in at Garden City. We were 100 miles south of our alternate course to Chicago, but at least we were on our way. We helped roll the ship into the hangar and taxied into town. That night we took stock.

"We should have stayed on the ground in Denver," Groenhoff summed up. I agreed. "That cold air mass moving down from Canada," he went on, "is overriding a lot of warm air and causing fog and rain. This is no weather for airplane riding."

I supplemented his observations. "We crossed railroads and several highways. If they had been identified at 10- or 20-mile intervals so they could be seen from the air, with an arrow pointing to the nearest airport and the mileage specified, we wouldn't have got lost."







"Amen," said Groenhoff. "With two men in an airplane working hard at flying and navigating, and still getting lost, what is the casual flyer going to do when flying becomes more general?"

We decided something else: In addition to big identifying marks on airports themselves, each airport needed a circular fence of arrows, at least 20 miles in diameter, pointing to it. And, of course, every hamlet should paint its name in 50-foot letters on a roof or in a public park. Only then would cross-country flying become as effortless as automobiling.

If the weather didn't clear entirely, at least it was less stinko, as Groenhoff put it. We bored eastward. At Hutchinson, Kan., STORM. Here is one of the few good pictures ever made of a thunderstorm from the air. At the lower right, a ribbon of roin is seen between the claud and the darkened earth, while the sun is shining near by. In the photo at left Arthur R. Magee, Federal meteorologist at Goodland, Kan., worns francis of thunderstorms gathering ahead.

we were squared away to land when I spotted some cattle on the field,

"That can't be the airport," I said. We found it, but only after another hunt. By now we were past the point of getting aggravated. Besides, to be truthful, we were getting too much enjoyment out of the flying itself to get irked by the inconveniences. We were watching each other like hawks on sharing the flying time.

"It's my turn in the left seat," I announced after we were gassed. "That's right," Groenhoff agreed reluctantly.

We checked the weather through the Hutchinson Navy airfield. The ceilings were not good but we played it safe. We followed railroads, confirming our visual observations with the radio receiver. If the weather had got thick, we could have raced to an airport and sat down. Carefully we marked every airport on and near our course that could serve as an emergency haven.

We passed up Topeka in favor of a small airport at Lawrence. Here we ran into a new one. A huge sign on the sloping roof of a barn read (Continued on page 207)

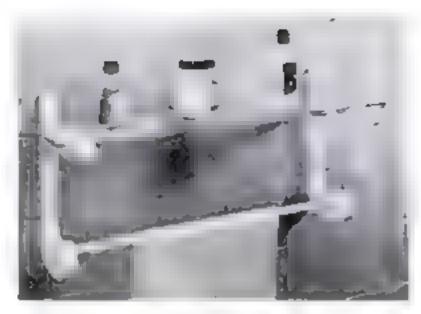
What's New in Modern Living



PLASTIC SCREENING, pliable, rust resistant, water repellent, and sturdy, is being manufactured now for all household uses to which metal screening has been put in the past. That shown in the photo above is a plastic window mesh marketed under the name of Saran screen.

NONSLIP hangers for dish towels, aprons, and the like, promise to cure the vexing habit these kitchen items have of falling off the rack. The Ketchook, manufactured by the Plastic Die & Tool Corp., of Los Angeles, holds the article securely yet allows it to be removed simply by lifting. It is said to embody a new principle of operation and is made in a variety of colors to match kitchen color schemes. The device is fastened to the wall by means of two screws.





BATHROOM AND KITCHEN accessories now on the market include a combination 4" by 18" glass shelf and 16" wood towel rack made by George Koch Sons, of Evansville, Ind. Brackets and rod have a white, washable finish.

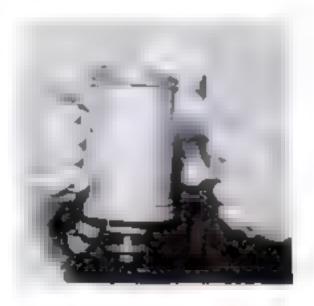


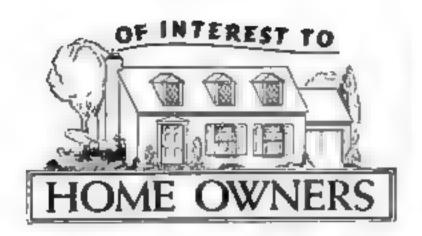
WAKE UP TO MUSIC with the help of this electric clock that turns your radio on or off at any preselected time. It can be used to time many household appliances, and is made by the Warren Telechron Co., of Ashland, Mass.



GLASS SERVICE SETS for breakfast juices include a bowl for holding ice cubes to keep the contents cold. George Sakie, of the Fostoria Glass Co., is the designer.

DOUGHNUTS ARE SHAPED automatically simply by pressure on a pump when dough is put in the pint-size aluminum device shown at right. The unit was developed by the Crosby Research Foundation.





DECORATIVE lighting methods have been getting attention from manufacturers of fluorescent lamps and fixtures, as can be seen from the typical units illustrated here. Realizing that the bare and unattractive installations now in use can be applied only to the service parts of a house, designers have turned to adaptations of concealed and circular lights. Some of the novel and interesting effects that can be obtained through the use of recessed fixtures

are suggested in the composite view at the upper right. Of special importance is the trend toward employing lighting as a functional part of modern furniture. The designs pictured here were worked out by Westinghouse lighting engineers.

Panel fronts are also expected to play

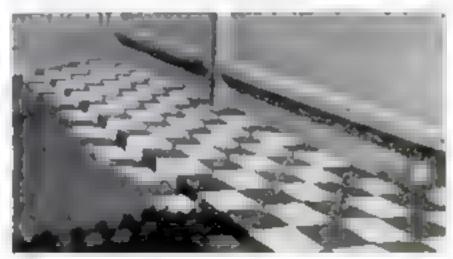


a part in softening the glare of luminous tubes and helping them to harmonize with the color scheme of a room. The picture at the left, supplied by General Electric, illustrates an interesting color-blending fixture designed by C. T. Masterson. Three types of plate glass are used to filter the light, and the bright edges are obtained by beveiling the rear surface to 45 deg. All the installations shown here employ tubes of small diameter.



THIRSTY PETS will always find water in the trough if you let the Sim-Plex Automatic Float Valve remember to fill it for you. Recently announced by A. D. McBurney, of Los Angeles, the valve maintains constant water supply in pans or tanks and is suitable for poultry, farm, or household uses.

BATTERY CASES converted into paving blocks make an unusual back-yard walk for Fred W. Fletcher's San Francisco home. Some years ago, Mr. Fletcher took several hundred discarded storage-battery cases that were on hand at his service station, filled them with sand and cement, painted half of them white, and laid them out as shown. They have outlasted many concrete pavements in the neighborhood.



Gus Cures a War Headache

By MARTIN BUNN

EY, boss," Stan Hicks said with somewhat forced breeziness. "I've dug up

a new customer for you!"

Gus Wilson's expression was noticeably lacking in gratitude as he regarded the Model Garage's grease monkey and blossoming mechanic. "Well, now, that's just dandy," he told him sarcastically. "Here I am working four or five evenings a week trying to keep our regulars happy, and you go out and dig me up a new customer. I'll tell you what, Stan-get out your shovel and cover him right up again!"

Stan grinned sheepishly. "Well," he admitted, "maybe I'd ought to have said that this party is a sort of personal friend of mine, and would you do me a favor and

take a look at-"

"Who is he?" Gus interrupted.

Stan's face got red under its habitual coating of grease. "Well," he stammered, "it gin't a he-it's a she."

"Oh," Gus smiled, "so that's it?"

"No, that ain't it!" Stan protested, "I used to go to high school with this Barbara Milligen. She's always been car crazy, and ever since she was a kid in freshman class she's been saving up her dough to get herself one. When she got a job in a war plant about a month ago she had to have a bus, so she took her coin out of the bank and bought an old sedan from one of those big used-car dealers down in the city. She ain't as dumb about cars as most girls, but it looks to me like they sold her a quince. Can I bring her in? She's outside now."

A minute later a much-shined-up 12-

"I wish I'd never set eyes on this junk wagon," she said.



year-old green sedan was driven into the ahop. Gus noticed that its tires were good and that its engine was running smoothly Stan got out on one side and a red-haired girl with a flock of freckles and an expression of concentrated fury got out on the other. She looked at Gus unsmilingly and announced: "I wish I'd never set eyes on this junk wagon, and I'll bet you will, too, after you've worked on it."

"Don't mind Barbara, boss," Stan put in diplomatically. "She's always been a sour-

ball."

Barbara's green eyes blasted him. "Keep out of this, jerk!" she snapped, "I'm talking to Mr. Wilson."

Stan's feelings were outraged. "Yeah, you're talking to him because I did you a favor getting him to bother with your broken-down old bus!" he velled. "And now

the gratitude I get-"

Gus laughed. "Don't quarrel, kids," he advised. "There's no sense in getting sore at a car, miss-I've done it hundreds of times, and it never did a bit of good. Suppose you tell me just how yours has been acting up and what you've done about it."

Barbara's face crinkled into an attractive smile. "O.K., Mr. Wilson," she agreed. "Well, I knew enough about cars-mostly from always wanting to own one-not to expect to get a super-duper de luxe job for what I paid—and I didn't. I did expect something I could drive back and forth to the plant without continual trouble—but I didn't get that either.

"The first few days, it ran fine. Then the

battery got weak, and one morning it didn't have enough kick to turn the motor over. I had it recharged, but the next week it ran down again, and the man at the garage said it must be the generator. He went over it and put in new brushes and everything, and nicked me plenty. Inside of a week the battery was down again, so I took the car back to the place where I'd bought it, but they wouldn't do anything—and got fresh about it, too.

"I have to be in a car pool, of course, and every time it's my turn to drive I have a lot of trouble getting started—and usually we're all late for work. The others in the

POPULAR SCIENCE



When it was her turn to drive, they were usually late. The others in the pool were beginning to get sore.

pool are sore and say they'll drop me if I don't get my car fixed. Others will hear about it and won't want me in their pools, and I'll have to give up my job—and, believe me, Mr. Wilson, those fellows fighting in the Pacific need what I'm helping to make!

"Well, while I was wondering what I could do," she went on, "I ran into Stan, and here I am. I'll have to leave the car here—my shift goes on at four o'clock. I can take a bus to the plant, and coming back tonight—"

"Never mind about tonight," Stan told her, "If we can get your car fixed, I'll drive it over and pick you up at the gate, and you can drop me at my house on your way home."

"Why, Stan, that's real nice of you!" Barbara said.

"Oh, well-I haven't got anything to do

tonight," Stan muttered in embarrassment.

Barbara's green eyes blazed again. "If that isn't just like you!" she cried. "You always spoil everything by being so—so unuracious!"

"Scram!" Gus shouted. "You two do your scrapping outside. I'm a busy man."

Five minutes later Stan came back grinning and found Gua checking each cell of the battery of Barbara's car with a battery voltmeter.

"They're all run down a bit, but they test even, so there can't be anything much wrong with the battery," Gus commented when he had finished. "Guess we'd better take a look at the cutout."

Finding nothing wrong there, he turned to the generator. So far as looks told, it was in excellent condition, but when he checked it he found that it wouldn't charge the battery properly until the engine was turning over at a speed rate of 40 miles an hour.

"There it is," he told Stan, "Your friend Barbara's battery runs down because the generator doesn't charge it while she's driving. The juice that's drained out isn't replaced. Well, we've found the cause of the trouble; now we've got to find the cause of

the cause. Take the generator out and put it on the test bench."

Stan did as he was told. Gus put in 10 minutes going over the generator carefully, looking for mechanical defects which he didn't find. Then he hooked it up with the test-bench drive motor for an electrical check. When the tachometer showed that the generator was being driven at a speed of about 600 r.p.m.—corresponding to a car speed of about 10 miles an hour-it began to charge, and as Gua gradually increased the drive-motor speed to 1,400 and then 1,800 r.p.m., the ammeter hand moved over to 10 and then to 12 amp.

Gus looked puzzled as he switched off the drive motor.

"There's nothing the matter with this generator," he told Stan. "It works perfectly when it's driven by the test-bench motor, so there's no reason why it shouldn't work perfectly in the car. But it doesn't! Well, we'll try again."

They reinstalled the generator in Barbara's car. Then Stan stepped on the starter and gradually increased the engine speed as Gus checked the generator output.

"Switch her off," Gus directed after half a minute. "It's exactly the same as it was before. The generator doesn't start to charge the battery until the engine is running at almost 40. There's something acrewy here—and maybe it's me!"

Staring at the generator, he slowly filled and lighted his pipe. After a couple of puffs, he snapped his fingers loudly.

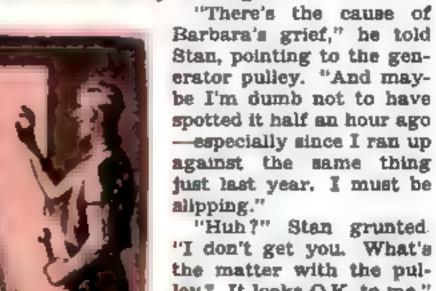
"That might be it," he muttered. He copied the generator serial number on the back of an envelope, went over to his workbench, and reached down his service manual from the shelf above. Then he checked the serial number against the generator numbers in the manual. Stan was peering over his shoulder.

"It's the right generator for that model car, all right," Gus said. "The same generator is used on several other makes, too—

but look here! A lot of the parts of this generator are interchangeable with the parts of other generators made by the same manufacturer. Maybe that's it!"

"Maybe what's it?" Stan demanded.

Gus didn't answer. He went back to Barbara's car and again examined the generator. Suddenly he laughed.



"There's nothing the matter with the pulley," Gus told him, "except that it's much larger than the one called for by the specifications for this car. Naturally, the larger the pulley, the slower the gen-

more engine speed is nec-

essary to make the generator charge the battery. This pulley is so large that this generator doesn't start to charge until the car is being driven close to 40 m.p.h. Your friend Barbara probably never drives fast, so her battery never gets recharged."

"I get you," Stan said. "But what I don't get is how this oversize pulley got there."

"Like a lot of other headaches," Gus explained, "that's a result of war shortages. Auto electrical concerns are reconditioning all types of generators these days, and when you send in one for service or exchange you run the risk of getting back the right type of generator with a pulley of the wrong size on it unless you are careful to specify the car it's to be used in. Evidently when Barbara's car was reconditioned for sale. the right generator was picked up, but the man doing the assembly didn't notice the size of the pulley. That's an easy mistake to make. On a secondhand job the fan beit usually is old and stretched so much that it will easily alip over an oversize pulley before the generator is tightened.

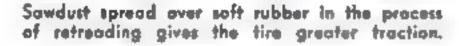
"I'll find a pulley of the right size in my junk box. You put it on, Stan, and then take the car over to Barbara and tell her about it. That'll give you something to talk about while you're driving home."

"O.K.," Stan grinned, "You can depend on me to take all the credit."



"If we get your car fixed," Stan told her, "I'll pick you up at the gate."





ORDINARY SAWDUST eventually may relegate tire skid chains to the limbo of crank handles. Seeking a method of giving tires better traction and eliminating chains, Clarence and Lonnie Gapen, of Morgantown, W. Va., experimented with a number of materials and finally settled upon sawdust. With the cooperation of the Andy brothers, who operate a tire shop in Washington, Pa., they developed a milling process by which sawdust is worked into the camelback used for retreads. In tests, the tires carried an auto up a 12-percent snow and ice-covered grade without difficulty, and started and stopped the car on the hill without skidding. Rubber companies now are making tests to see if the process increases mileage.

FORGED IN ONE PIECE, a new jack developed for passenger cars by John M. Westrate, of Detroit, has no movable parts to sitp or get out of order. After the head has been fitted against the brake drum, the auto is driven forward or backward until the





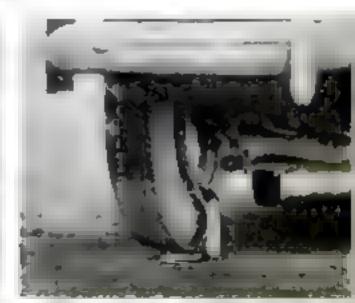
At the top, a sawdust camelback is applied. Bottom center is a normal retrood. At the right, a sawdust recap after 8,000 miles, and at the left a new one.

When the job is done, another short movement of the car frees it. There is no interference with removal of the tire or rim. Secured to the wheel with a safety strap, the device also can be used as a mud hook.

Inserted between the brake drum and rim, this one-piece jack raises the wheel off the ground when the car is driven either forward or backward.







WHAT'S COMING IN CONVERTIBLES

Will they go the way of the touring car and roadster, or will they soon join the mass-production parade?

By CHARLES T. PEARSON

ONVERTIBLES have always appealed to young drivers and to the sports-minded who like clean, racy lines and a low center of gravity. If new tops—some of them ready for production and some still on the designers' drafting boards—are any indication, this appeal is due for considerable extension into the ranks of conservatives.

Probably almost everybody likes an open car, but prewar conservative drivers often held back because of admitted disadvantages—such things as rattles, drafts, top material that faded and lost its shape, and imperfect provision for getting the top up and down

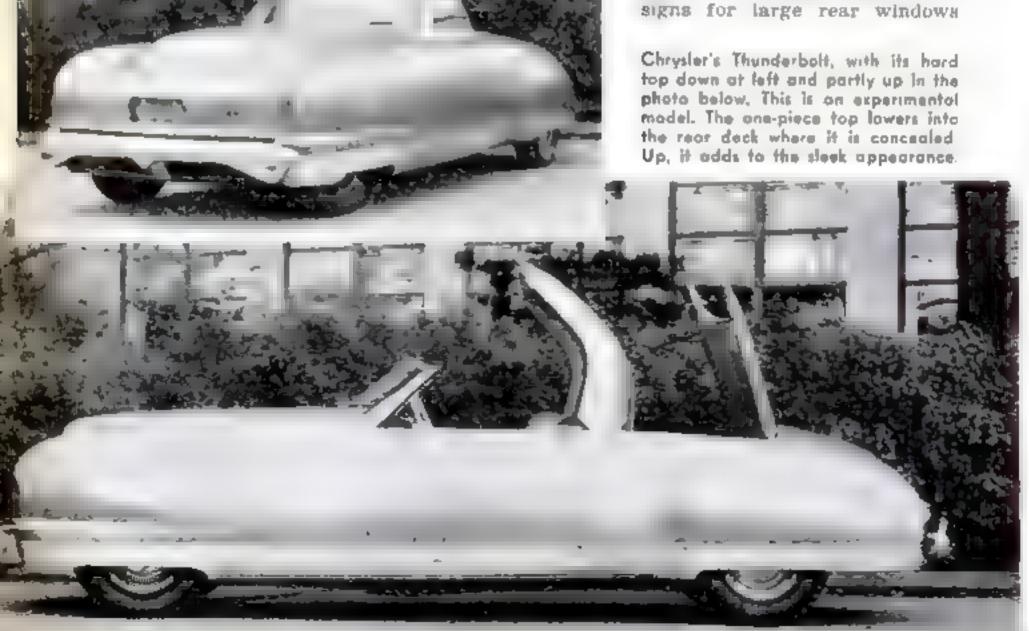
But the new open cars will be minus most or all of these disadvantages, and many in the automobile industry think the time is coming when the convertible not only will be the second car in most garages but the only car in many. Convertibles were estimated at 2 percent of the total production before the war, and prices ranged from \$100 to \$250 above those of closed models. As-

sembly-line production is expected to bring the price down nearer that of closed cars.

The push-button or power-operated top is a certainty, with hydraulic controls bidding for first place over electric and vacuum mechanisms because of the small amount of space required for actuating cylinders and because of the ease with which the power unit can be installed. A small 6-volt motor can be put in any accessible place and oil lines run to the hydraulic cylinders that operate the top bows and linkage. Oil pressure is so controlled that motion will stop if an obstacle is struck, and the mechanism can be operated manually whenever necessary.

Top designers predict that future convertibles will be engineered as a unit instead of as in the past, when little more was done than to cut off the top of a standard model and add a cloth top. With the new top made part of the car before it leaves the drafting board, a convertible with its top up will have the sleek lines of a streamlined closed car and its own racy open-car lines

when the top is down. The back will have the hard-top curve side windows will be larger, and the rear window will be as large as that of a closed model. Designs for large rear windows





Buick's Fireball has a modern automatic folding top of the push-button type. The car was built in 1940 by Harley Earl, G.M. styling chief, and Buick engineers as a "style laboratory on wheels." At right, the top is shown partly up "along with the rear-deck panel that conceals it. The panel and top work together automatically.

Below, Packard's prewar convertible by Darrin. It has an automatic top that fits almost flush with the deck when down to acceptuate the sweep of the curve of the Continental-styled door.

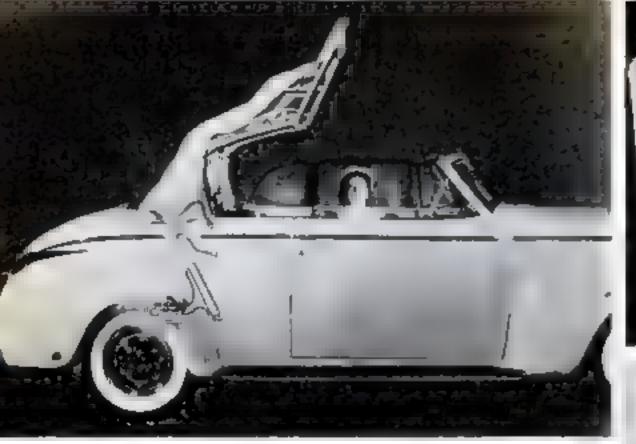


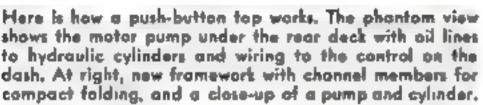
have already been perfected. Some lower into the rear deck at the touch of a button to allow open-car sweep of the breeze combined with closed-car protection against sun. One new rear window is designed for curved plexiglass and duplicates the sweeping lines of streamlined closed cars.

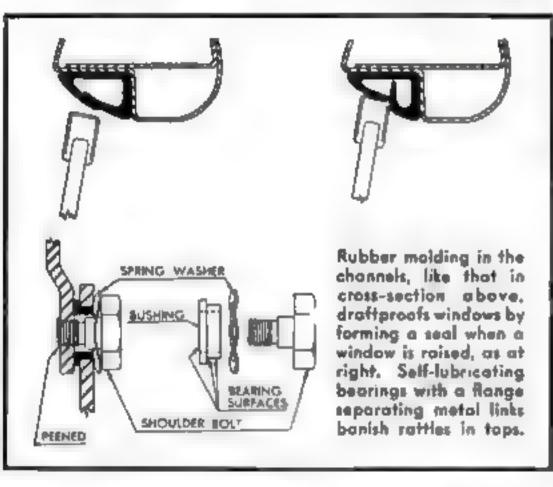
Control mechanisms have also undergone revolutionary changes since the day of the old "one-man" job that frequently resisted all efforts to be bent to the driver's will. Mechanically co-ordinated bows actuated by hydraulic cylinders now automatically fold

the top into place. Lighter metals, some developed in war production, reduce weight, and self-lubricating bearings stop rattles. Inside linkage is at least partially concealed, and the top is designed to make automatic, draftproof juncture with the body, windows, and windshield.

Fabrics are being improved, too, both for tops and all-weather upholstery. Synthetics and plastics are under consideration for tops, some of them opaque with bright, durable colors, some translucent, and some even transparent. The ideal top fabric will







retain color as long as the body does; it will be waterproof and dirt resistant or easy to clean; it will be wrinkleproof or wrinkle resistant, capable of withstanding repeated folding; and it will be available in a variety of weaves and colors.

Hard-top models are still in the experi-

mental stage, but they may be offered to the public when car production gets into high gear. Design has generally featured a one-piece metal top over a single seat. A single-piece hard top for a club coupe requires a lot of room when lowered into the deck, and even the single-seat experimental models use space needed for luggage. One designer is experimenting with a hard top in sections automatically folded togeth-

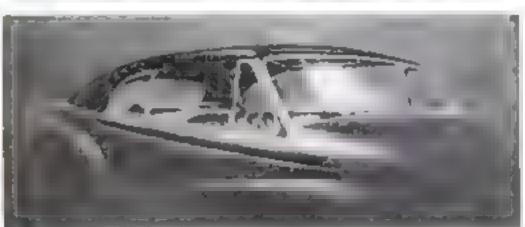
Most old-line manufacturers, and many dealers, too, were inclined in the past to look upon the convertible

as expensive window dressing. But returning service men and women, accustomed to the exhibitanting speed of open military vehicles and the clean lines of fast planes, will probably boost demand to assembly-line proportions. The convertible is decidedly here to stay.

er by hydraulic control.

New fabrics, synthetics, and plostics give the postwar convertible a smort closed-car look with the top up. At left, a translucent top; at right, an apaque model with a rear window that lowers into the deck.





Details of New Lincoln and Mercury Announced

Vion, the Ford Motor Company has completed its first models of the 1946 Lincoln and Mercury. The Lincoln has a new grille that makes the front appear lower and broader. Bumpers are wider, and fog lights are built in. An electrically operated hydraulic mechanism for opening and closing windows has been made standard, but the mechanical lift will be available as special equipment. Oil-pump capacity has been increased, hydraulic push rods have been improved, and the oil-pan capacity has been increased to seven quarts.

A lower, heavier, and wider-appearing

Mercury is also chiefly the result of a new front grille. Mechanical changes include triple-alloy bearings, crankcase ventilation, oil-type air cleaner, an oil cleaner, an improved oil pump, four-ring aluminum pistons and interchangeable cylinder heads,

The 1946 Ford V-8 engine develops 100 hp. as compared to the 90 hp. of the prewar engine. As in the past, a six-cylinder Ford engine will also be available. Many of the mechanical features of the Mercury have been included in the Ford, along with shock absorbers that have oil seals, foot brakes requiring less pressure, a Lincoln-type hand brake, and springs with more leaves.





Grilles of a new design help to give both the 1946 Lincoln and Mercury a broader, lower appearance. The new Lincoln, shown at the top, has a number of mechanical improvements, as has the new Mercury, directly above. Several mechanical features of the Mercury now are standard in the 1946 Ford, at the left. The latter already has gone into production.

GLASS-TOP COFFEE TABLE

WITH MAGAZINE BINS

By John Hugelmeyer

ROM two large-size cardboard photohypo containers, some plywood and leatherette, and a glass top came the maroon and lyory coffee table shown on the facing page.

If you don't go in for photography in a big way, discarded containers can be obtained from your local photographer. With a sharp knife cut shaped openings in them, as indicated in the photos, and then cut them to height. Leave the wood bottoms in place as tops, for screws can be put through them

Photo-chemical containers with wooden bottoms are provided with openings and cut to a height of 15".

to hold the plywood top in place. Strips cut 2½" wide from waste parts of the containers are glued in as shown to support a plywood shelf in each of the two bases. In cutting the shelf disks allow room for leatherette covers to pull over the edges.

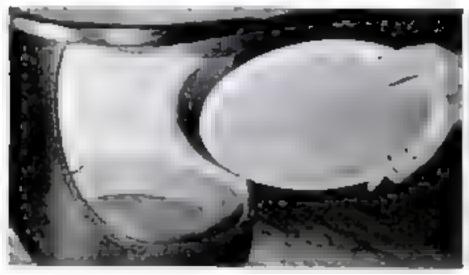
Measure the exact diameter of the bases and sew up two sleeves of maroon leatherette to pull over them like stockings. The leatherette will stretch, so make the sleeves a little skimpy for a good smooth covering. Trim the opening with a razor blade, drill holes %" apart near the edge, and lace with

%" wide strips of maroon leatherette. Cover the plywood top with ivory leatherette tacked to the underside, and edge it with a 1" strip of maroon leatherette glued and tacked on over a strip of cardboard for firmness. This binding projects %" above the plywood and serves to hold the glass top in place. It is best to make a pattern of the plywood top and have an expert glazier cut the glass.

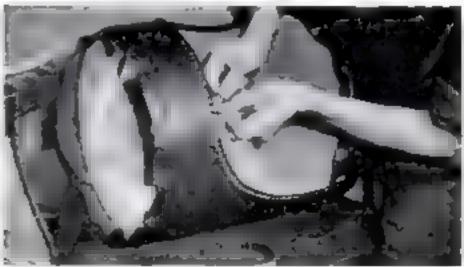


Disks are cut from "" plywood for a shalf in each container, and the insides are then painted ivary.

Strips from waste parts of the containers support the shelves, which take ivery leatherette covers.



Moroon leatherette is sewed to size, pulled an like stockings, trimmed, and laced at the edges.

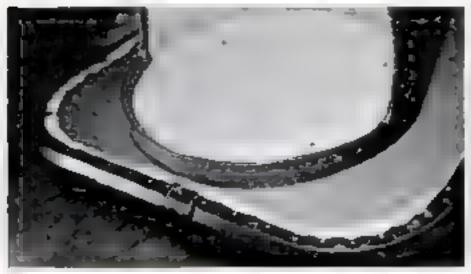




Glass over leatherette-covered plywood provides a fine, stainproof top. Bins in the base hold magazines.

Screws put through the wooden ends of the bases fasten a "" by 22" by 38 plywood top in place.

Ivory leatherette covering the top is tacked on the underside and edged with maroon leatherette.





Jar Set Provides Simple One-Evening Woodworking Project

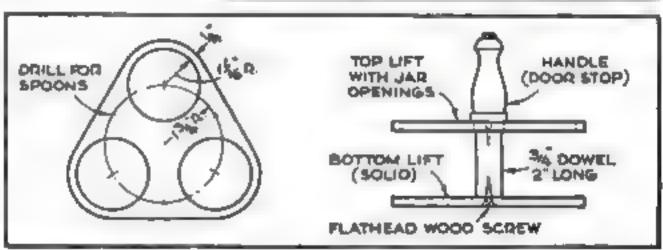
NY HOUSEWIVE will welcome this jar set, which holds three kinds of spices, nut meats, candied peel, or confections. Designed for three of the 4-oz. jars in which prepared baby food is sold, it consists of two lifts cut from ¼" wood, a door stop, and a ¾" dowel 2" long.

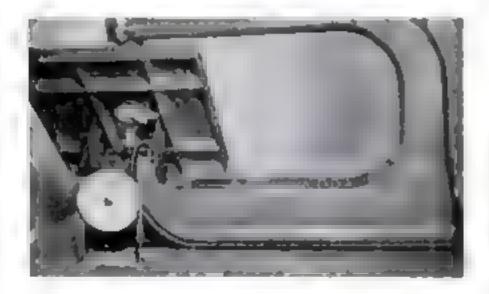
A compass is used to lay out the top. Draw a circle with a radius of 1%" and use the same compass setting to divide it into six equal parts. At alternating points on the circumference, as indicated in the sketch, form three circles with a radius of 1 1/16"—a size about %" larger than the jars. Drill holes at the other three points on the circumference of the large circle to receive small spoons.

As a guide in marking the outer edge of the triangular piece, connect the outermost points of the three small circles with tangent lines. Cut out the top lift and use it

to lay out the solid one for the bottom. Attach the lower lift to the dowel with a flathead screw and the upper one with the door stop, which thus serves as a handle. Paint the edges of the lifts and the tip of the handle any gay color.—Victor Roming.







Tube on Crankcase Air Vent of Jigsaw Keeps Out Dust

CONSIDERABLE sawdust was sucked into the crankcase of the jigsaw shown in the photo because the air vent is located near the path of the dust falling through the saw aperture. This was finally prevented by attaching a rubber tube to the pipe of the vent and running it away from the dust area. The tube was kept out of the way by fastening it to the bench with wire staples.

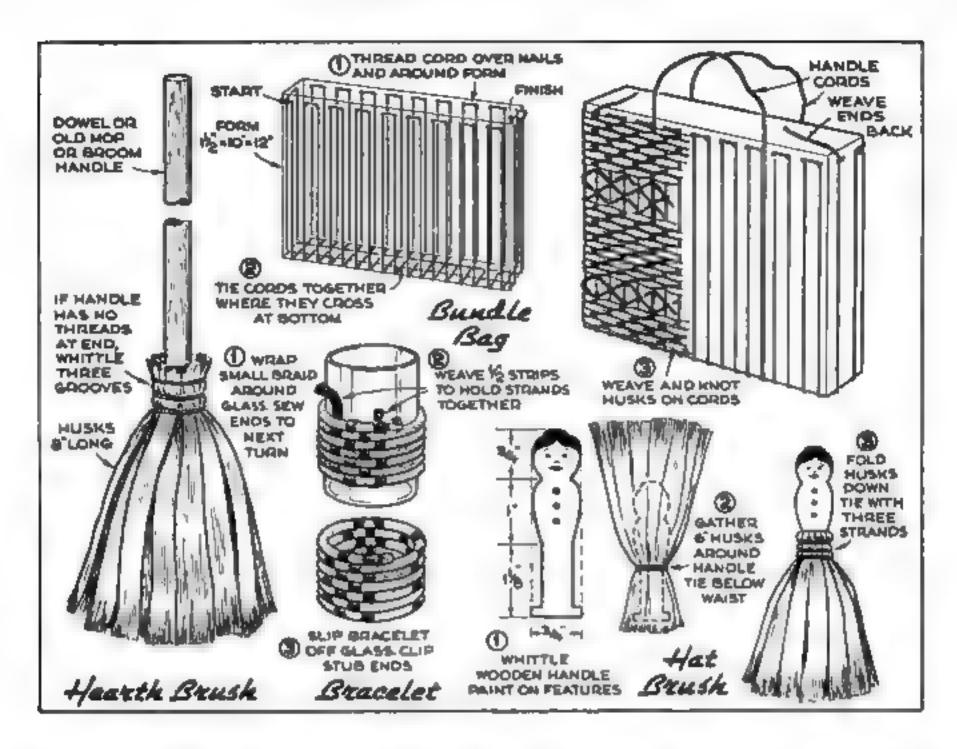
Your Dinner Guests Will Like This Homemade Place Favor

A Powder puff and soda straws, cord and ribbon, and wooden beads—that's what this place favor is made of. The cord was run through the straws and knotted, then bent to provide joints for the arms and legs.

From the legs the extended cord WAS through the skirt (a small powder puff) and the beads that form the body and head. After being tied around the hair ribbon, the cord was slipped through a hole in the top of the card. Features were inked on the head bead, and the skirt was sprinkled with sachet powder. A prop on the back holds the card upright,-B, N,



BERTRAM BROWNOLD.



Husking Time Provides Fun and Projects for Fall Evenings

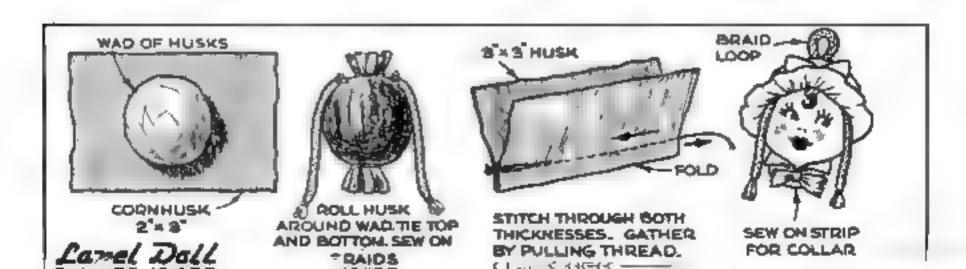
FIELD corn is in season and its abundant husks can keep farm families busy making useful and ornamental objects. City dwellers, confined to sweet corn at a dozen ears at a time, can save up husks for projects.

Cornhusks should be used damp. Cut off the butt ends, separate the coarse outer and soft inner husks, and cut them into strips of desired widths. For dyeing, soak them a few minutes in hot water, squeeze out the surplus, and then work them in the dye bath with your hands.

Coarse husks are used in strips for brooms and brushes, as shown. Soft husks for the bracelet illustrated, chair seats, and hot pads, and coarse ones for floor mats, are braided first—loosely for thin, flat projects or tight for thick ones. New strips are braided in as necessary. Keep the stube on the underside and clip them close when the braiding is finished. Sew the braid into the desired shape and weave with strips of husks contrasting in color.

A useful bundle bag is shown above and on page 104. Wrap the cord around the nails, from side to side and then from end to end, tie at every place it crosses, and add a heavy cord for the bandles. Weave with strips, weaving the bottom first and continuing on up the sides. Strips are added as needed by knotting. The diamond pattern dividing the woven sections is made by tying strips to the cord frame. For proper weaving, strips must alternate under and over each cord for its entire length, and therefore, so there will be an uneven number of cords, one of the handle cords is treated as a separate cord in weaving and three are grouped with the cord next to them. When finished, pull out the nails and remove the bag from the wooden form

Husks wadded and covered by a soft husk, as shown below, make heads for both the lapel doll and the boy in the whistler-and-dog bookmark shown on page 104. The dog's head is a blunt triangle,—ELMA WALTNER.



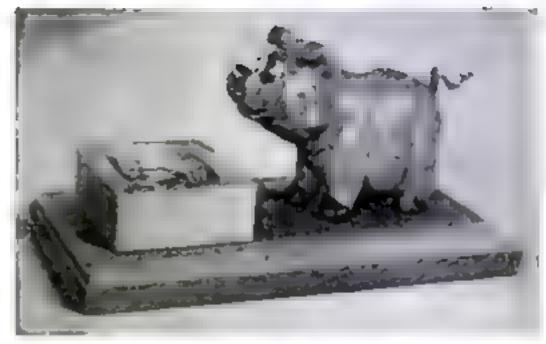
Whittled Pig in Desk Set Has Paper-Clip Trough

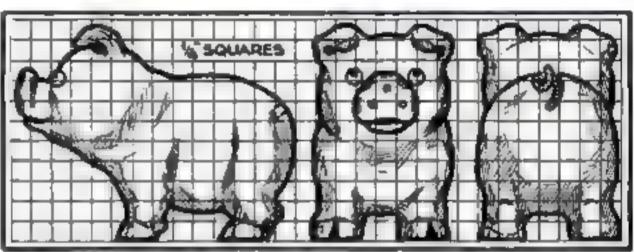
PAPER clips, not truffles, fill the feed trough of Percival, but the little pig's pudgy, upturned shout remains cheerful. For all his unusual diet, he retains that well-fed look so becoming to porkers.

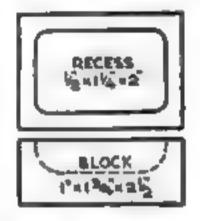
Lay out the figure on a 1%" by 2%" by 3%" block of soft pine, and saw out the profile roughly to shape. The rest is done with a

sharp jackknife, the stock being turned often to assure roundness and correct proportions. Sand off the rough spots, for you won't want even a young pig to be too angular. Then drill for the curlicus tail, which is a short length of pipe cleaner engagingly kinked and glued in place. Drill a small hole through the nose to hold a wire ring. Finish with a light oil stain, touching up the tail to match, and add white map tacks dotted with black for eyes.

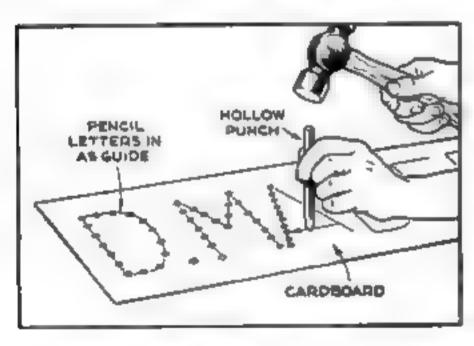
The trough is a 1" by







1%" by 2%" block hollowed out with a chisel. Sand it well, apply a coat of varnish, and then wax it. The base is a %" by 3%" by 6%" block with a %" bevel around the four top edges. It is also sanded amooth, varnished, and then waxed. Mount both the pig and trough with small flathead wood screws run up through the base and countersunk.—ELMA WALTNER.

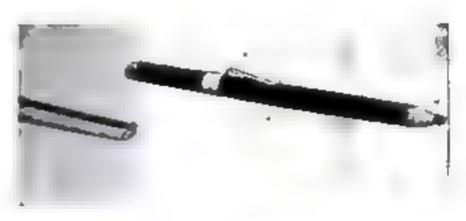


Hollow Punch Cuts Stencils Lettered on Cardboard

When a name or other lettering must be repeated a number of times on boxes, signs, and the like, a stencil can be cut quickly in cardboard with a hollow punch. Letter the name in with a pencil to guide the punch and lay the cardboard on several thicknesses of newspaper. The cardboard should be heavy enough to stand up under use, but not so thick that brushed or sprayed paint won't penetrate evenly.—BERNARD MATZEN.

Pocket Clip Fits Flat Pencil

CLIPS for flat carpenter's pencils can be cut with tin shears from hollow curtain rods of the kind shown beside the pencil in the photo. The clip part is bent to shape in a vise or with pliers, and burrs that may be left by the shears are smoothed off with a small file—RONALD EYRICH.

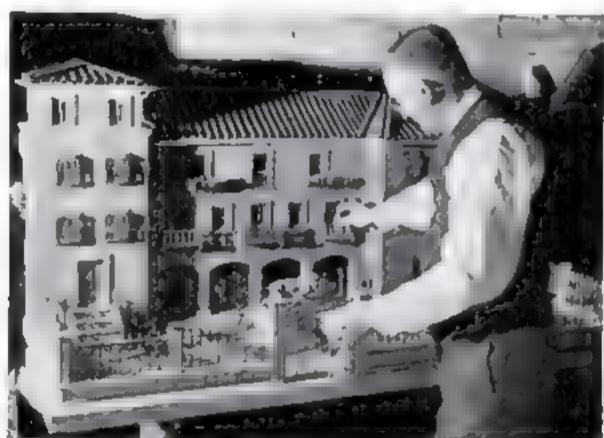


OT content with fashioning intricate models of ships, buildings, and the like, Segundo Garcia, of New Brunswick, N. J., surrounds each with a lifelike scene in which all items are formed to scale. For example, his model of the Morro Castle, which burned off the New Jersey coast, has passengers in lifeboats and others in the water awaiting rescue. A 544' model of the Manhattan is docked beside a pier covered with stevedores, loading yans, and stacked cargo for local color,

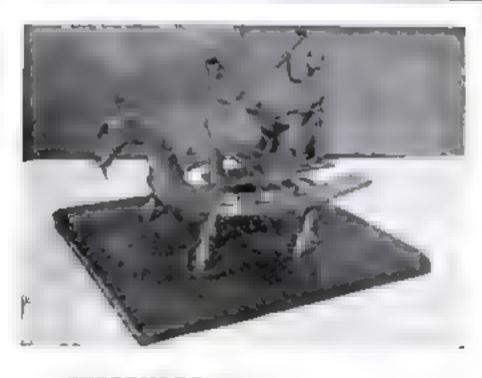


In this fully equipped cellar workshop, Segundo Garcia, a machinist by trade, finds a satisfying autiet for his creative ability by producing models of many kinds. Visible here are some of the ships he has built.

Maestro of Modelmaking



Made of wood to resemble stone this Spanish mansion was one of Garcia's most ambitious pieces. It is 5' long and 39" high. A stoicless steel gate swings on tiny hinges, the railings are of brass, and corrugated metal was pointed so it would look like a tile roof. Note the small tree and carved figure in the patio.



Shaped by hand from stainless steel, the symbolic black-smith group at left took two manths to make. Its detail reflects the artist's touch inherent in all Garcia projects.

Carefully fashioned from makegany, this 18" hull even-tually will become a trim square-rigger. Like the others, it is built to scale.



SEPTEMBER, 1945

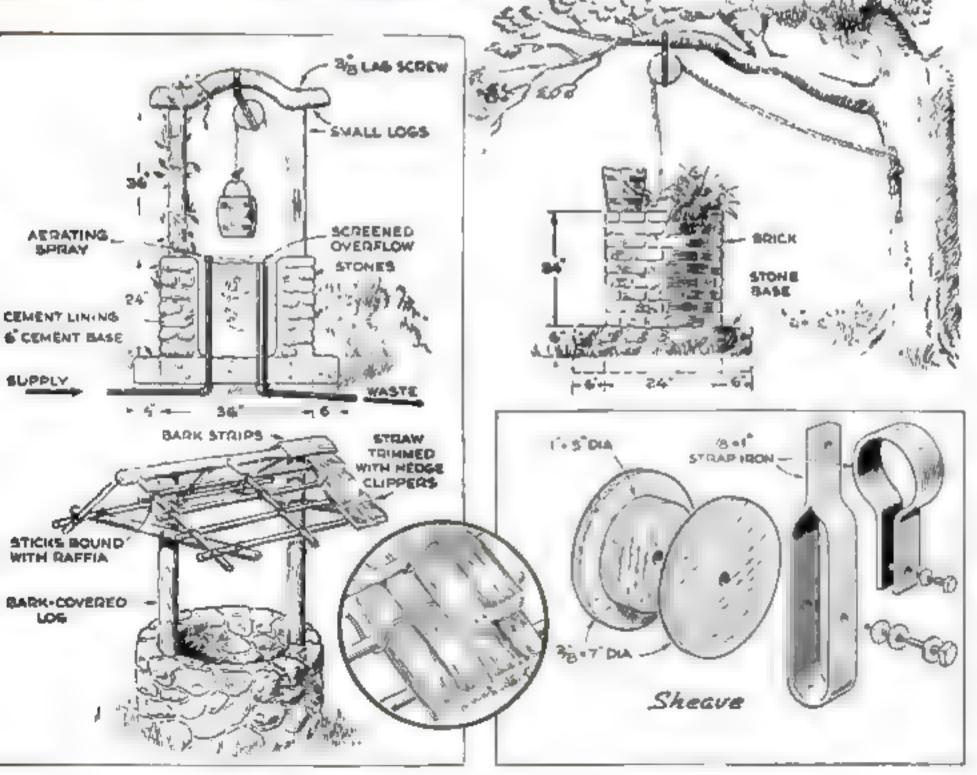


If You've Been

A DUMMY WELL IS A DECORATIVE FOCUS OF INTEREST IN A GARDEN

WELLS like these never run dry—they are dry at the start, being intended solely for their ornamental value as a focal point in a garden. If you are so fortunate, however, as to own a real well, there is no reason why you cannot build a rustic stone wall around it to increase its beauty. Or, in the case of an artificial well, you can pipe it for a water supply and drain, cement the inside to make it water-tight, and have it serve as a fish or lily pond.

Stones and timber for a wall and superstructure can often be gathered in near-by fields and woods; old bricks may be collected, if preferred; and scrap strap iron, if needed, and a suitable pulley may be found in a junk pile. A



Wishing for a Well ...

wooden pulley may be built as shown in a drawing. Some sand and cement will also be required for mortar

Several designs for rustic wells are shown in the photos and drawings. Start any of them with at least a 6" foundation, buried or exposed. Be sure to provide for drainage of any parts where growing plants are to be included.

Set the posts into the masonry of the sides, and they'll stay tight for a long time. Tree limbs, given several coats of varnish to help keep the bark on, add a rustic note. A thatched roof of raffia-tied branches may be added. The on large handfuls of straw with raffia, as shown in a drawing, and trim with hedge clippers when the straw is in place.

Hardware stores carry suitable wooden buckets, or a paint or wine keg can be fitted with a bail to serve.—H! SIBLEY,

Arched gracefully above a well built of out stone, a strap-iron support holds a pulley and old bucket.



Pair of Stirrups and Hooks on Ropes Is Tree-Climbing Aid

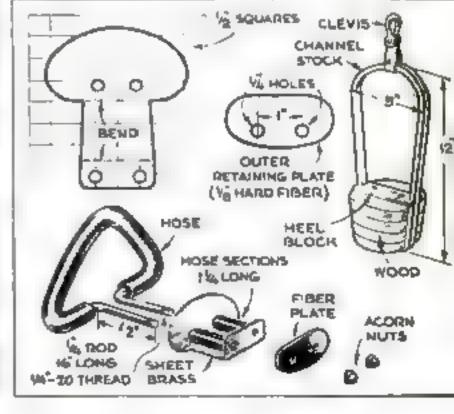


Above, raising one rope. A strop encircling both tree and body would add security.

Any tree can be climbed, or even a smooth steel pole, with a rig like this. A stirrup and a booklike clamp fitting joined with strong rope make one of a pair. Reach high, circle the tree with one rope, run it over the clamp, and put one foot in the stirrup. Your weight will anchor the device on the tree. Then reach up, attach the other rope, and step into its stirrup. Raise the first rope, which should be longer than the other, and repeat.

Put the long piece of hose on the '," rod before bending to shape and threading. Avoid nicks that may weaken the rod. The abort hose sections should turn freely. THOMAS MITCHELL.



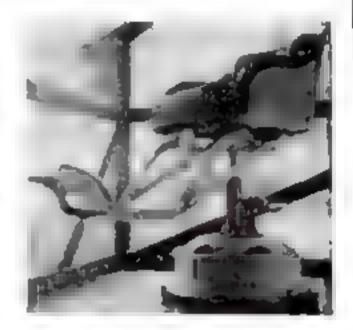


—Yankee incenuity in Unitorni...



AMERICAN SOLDIERS, always resourceful, are solving problems all over the world with the means at hand. Here, Sgt. Carl M. Perin (left), of Newport, Ohio, sheet-metal specialist at a base in Britain, and Sgt. Erwin J. Schwade, of Fort Atkinson, Iowa, use a compressed-air tank that Perin made from an oxygen container. A sheet-metal rack, fitted with pressure gauge and carrying handle, encloses the tank, which is light enough to move easily from job to job.

HAIRCUTS are given on Guadalcanal in a barber chair that has most of the comforts of home. It was built by men of the 282nd Ordnance Company from a discarded truck wheel, a hydraulic jack, a jeep seat, and other junked material. The jack handle was replaced with a foot pedal.



CORRODED SPARK PLUGS that were jammed tightly into their cylinder heads presented a problem to Master Sgt. Fred Covert, of Corsicans, Tex.—but not for long. Resorting to the technical know-how that men of the United States armed forces take along with them wherever they go, he soon evolved a procedure for extracting the plugs. He first rounded up several fire extinguishers at the Air Service Command Depot where he is stationed in England. Then he concentrated their blasts on a small surface, collecting enough carbon dioxide to form crystals of dry ice. Packing the crystals around the jammed plugs, he found that they soon contracted enough to be unscrewed.

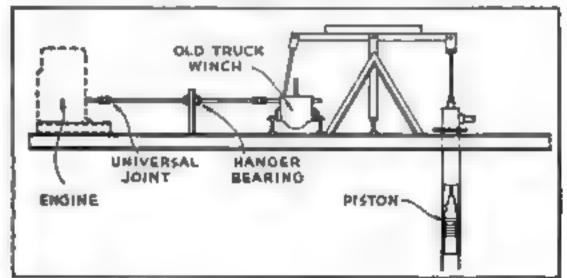


All THE PURE WATER needed at a Pacific base, which originally had to rely on a supply distilled from the sea, now is furnished by a pump built of odds and ends. Power is supplied by an air-cooled gasoline engine. A truck winch provided the worm gear that

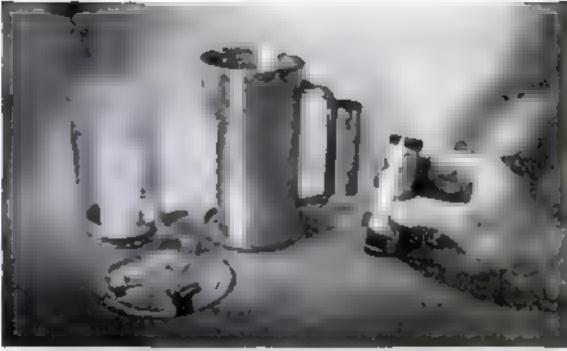
reduces shaft speed from 1,500 to 60 r p.m. The reciprocating action required to operate the 55' suction rod is transmitted by means of a crank, two pitmans, and a walking beam. The long rod was pieced together from sections of concrete-reinforcing rods. All parts of the piston assembly were machined from scrap metal. Leather suction cups were tooled from a rifle boot.



Morine Gunnery Sgt. Elmer C. Wickstrom, of St. Paul, Minn., and the pump he devised to supply water at a Pacific base.





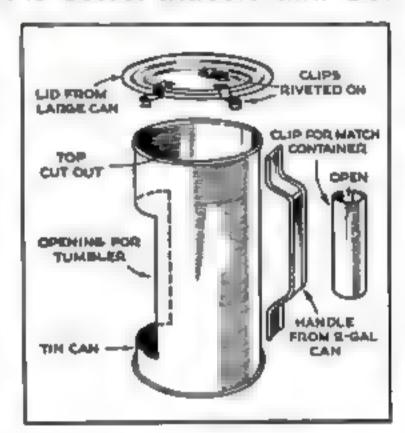


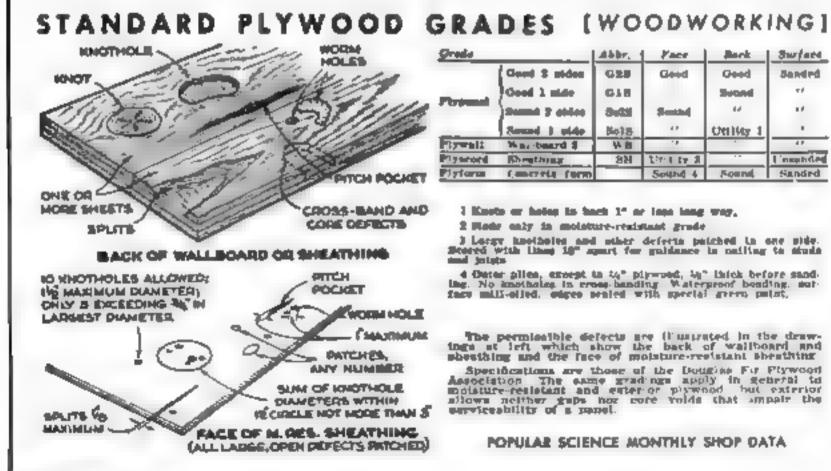
Candle Lantern Made from Tin Can Is Useful Indoors and Out

This lantern has a rather old-fashioned look. but you will find it handy in an emergency if you happen to be out of flashlight batteries. Remove the top from a tin can of suitable size with a rotary opener that leaves a smooth edge, and cut a rectangular opening in one side. The candle is held in a heavy tumbler. Spike it on a nail driven through the lid of a smaller can and set it in the bottom of the tumbier. The glass and a second lid, taken from a large can and provided with clips, protect the candle flame from wind.

A handle is soldered to the back of the lantern. and a rolled piece of tin-can stock is soldered on one edge to the handle. This forms a spring clip that will hold a beef-cube can in which matches may be kept.

The outside of the lantern may be finished, but leave the inside bright for a reflector.—R. S.





Grede		Abbr.	Face	Black	Surface
Physical	Good S sides	G28	Good	Good	Sanded
	Good 1 mate	CIB		Swand	e i
	Summit 2 ables	2000	Seeing	44	17
	Sound 3 side	No18	47	Ottling 1	
Towali.	Was beard \$	W 88	- 19		4.7
Plymord	Directoring	81	Little to R.		Unsubded
Piytora	Construct form		Sound 4	Found	Sanded

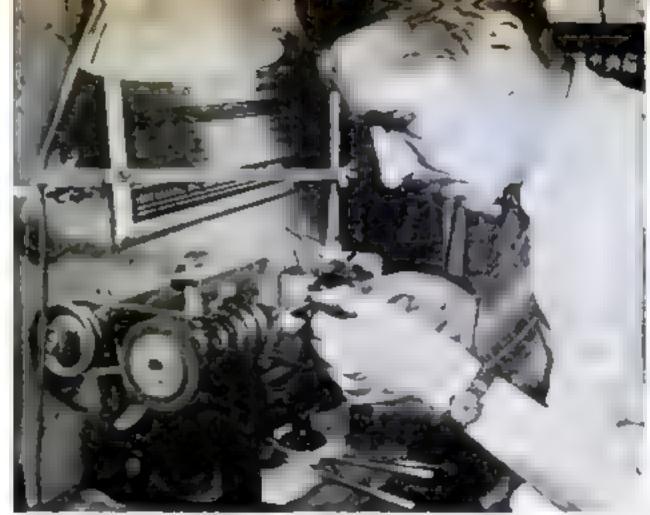
- 2 Made only in moisture-resistant grade
- I Large knotholes and other defects patched in one side.
- 4 Center plies, except to \$4° plywood, \$4° lines before sand-ing. No impulsion in cross-banding Waterproof bonding, sur-face militaried, edges senied with special green putst,

The permissible defects are (Fungasted in the drawings at left which show the back of wallboard and shouthing and the face of moisture-resistant shouthing

Specifications are those of the Dougles Fir Plywood Association. The same gradings apply in general to moisture-resistant and exterior plywood but exterior allows neither gaps now core volds that ampair the especies billity of a papel.

POPULAR SCIENCE MONTHLY SHOP DATA





Small tools are essential equipment in the workshop of modelmaker Joseph McCard, shown at right using a watchmaker's lathe to turn a table leg. At left, a nail too tuny for the fingers is limit with tweezers,

It's the Little Things That Count

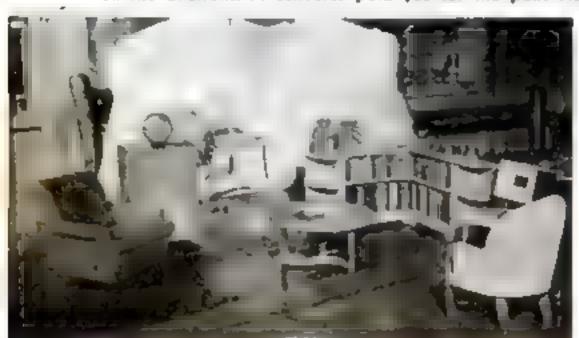
ODELMAKING led to a big event in the lives of Mr. and Mrs. Joseph McCord—their marriage. They met at the New York World's Fair, where between them they had built or were in charge of more than 40 miniature exhibits. Little things still are big business with them, and the second floor of their Greenwich Village home is lined with shelves filled with a variety of tiny objects they have made.

Like many other modelmakers, the McCords always are on the lookout for small tools to add to their collection. They use surgical, dental, and watchmaking tools, altering them, if necessary, to suit the requirements of a particular job. Frequently they design and make their own. Extremely fine work is done under a magnifying glass.

Mr. and Mrs. McCord specialize in furniture, but they also have built automobiles, boats, aircraft, and other items—all workable and formed to scale. Furniture manufacturers often study their models to determine the feasibility of putting full-sized pieces into production, and collectors willingly pay high prices for the items.

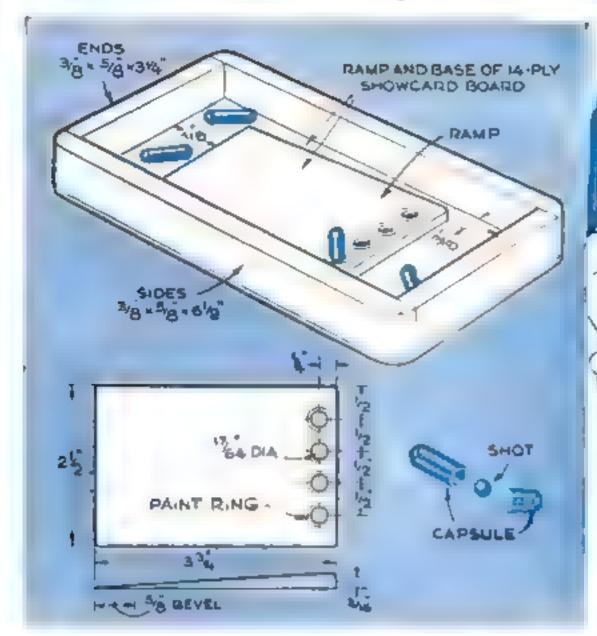


Just the right size for a Lillipution family, the furniture and pair of miniature brass andirons below represent many hours of patient work, each piece being formed to exact scale. Cigarettes serve as logs on the andirons. A collector paid \$65 for the pair. Note the 6" rule in the center of the tools above.





Pocket-Size Game Is Played with Lively Bobbing Capsules



the starting point for another try, and some already in holes may fall out and have to be maneuvered in again.

Each player keeps the board

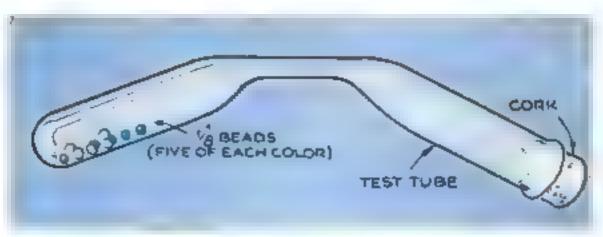
until all the capsules are in holes. Scoring may be by time or by the number of trips capsules make up the ramp.

You can make the game harder by lacquering half of each capsule one color and half another, and then requiring them to land in holes with the same color up. Druggists can supply capsules—FRANK SHORE.

PLAYED with four capsules, each containing a lead shot, this game will send you into tailspins of excitement and exasperation. The object is to roll the capsules up the ramp and into the holes. But there's a catch. Those that fail to stop in holes must be returned along the side of the ramp to •

Colored Beads in Test Tube Separate at "Bridge of Sighs"





MAKING this game requires little skill in glass bending; playing it requires quite a bit more of another kind. Heat a test tube at the center by rotating it in the flame of a Bunsen burner, and remove it when the flame becomes yellow. Then pull the ends to stretch the center while the tube is hot and bend the ends down slightly.

Put five %" beads of one color and five of another in the tube and cork it. The object is to separate the colors on either side of the "bridge."—GEORGE BARR.

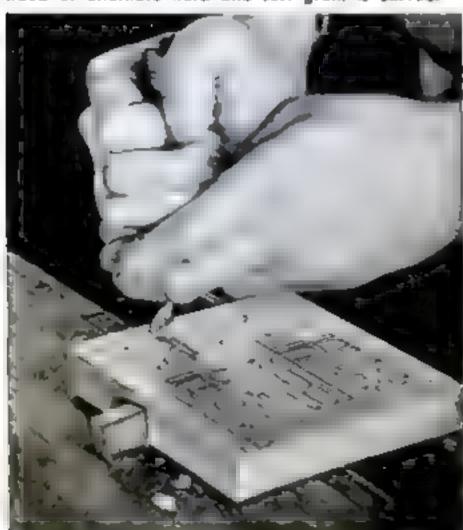


By EDWIN M. LOVE

OW-RELIEF, or bas-relief, ornamentation was often employed by early craftsmen who enriched the surfaces of chests with chisel-cut designs. It is the next step after chip and incised carving toward advanced wood carving.

As a variant, strapwork projects cover a wide field from simple layouts to intricate all-over patterns of interlacing bands, ribbons, and leaves. Low relief itself is espe-

Scoring across the grain assures clean edges when wood of alternate hard and soft grain is carved.



WOOD CARVING

Chisel and Strapwork Designs

cially suited to decoration of the rails and stiles of a framed assembly, if the shallow grounding will not weaken joints, and the flatness of its ornament is a good foil for boldly modeled panels carved in high relief.

What tools are required? Avoid boxed sets and choose instead from the hundreds of chisels available. Wood can be carved with a very few chisels, if necessary. It is best to buy a few good ones and then add to your collection as experience demands. These 16 chisels and gouges should be ample for all but the most professional needs: skew knife; %", 5/16", and 7/16" carving chisels; %", %", and %" firmer chisels; 3/32", %", %", %", 7/16", and %" veining gouges; V-tool or veiner; and %" left and right bent-back spoon akews.

How is the carving done? Take the low-relief book ends shown at the top of the facing page as an example. Draw the design with a pencil and try square, and gauge a pencil line along the edge to limit the border depth. If the material is spongy, or soft and hard grain alternate, score the edge of the raised parts across the grain to sever the hard grain and to prevent tearing of the soft wood. Experimental cuts on waste wood are advisable.

Then, with a 1/4" veining gouge held with the handle low, follow the scored outlines,

Grounds are roughed with a large gouge and then smoothed with a flatter gouge or a flat chisel.



IN LOW RELIEF

Ornament Frames and Panels

rotating the blade slightly for a shearing cut. Trim the ends first, and then cut the edges, guiding the course of the gouge where the grain tends to lead it off the line.

Cut the tops of the T's with the same tool, and then, making a stop cut at one end and working toward it from the other, cut the long stender center flutes that cross the grain. In spongy wood such as pine, take a roughing cut and follow with a trimming cut to depth. If the lengthwise flutes are made first, their edges will splinter when the cross flutes are cut through them.

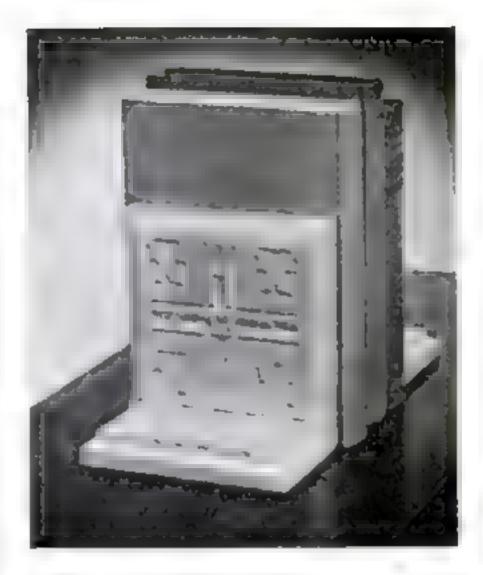
Now work the short flutes of the legs of the T's with a ¼" gouge, cutting from the round ends unless direction of grain prevents. Take the small gouge again and hollow the lengthwise flutes and center cross.

Are wide stopped flutes made the same way? Make stop cuts at the inner ends of the outer flutes; then establish the lines with light cuts of the gouge held in a vertical position, and deepen the center with a roundnose gouge or narrow flat chisel. The square in the center stops the inner flutes, but a little trimming is needed because of the greater depth of the wide flutes.

How is the border lowered? Carve away the ground with a wide gouge pushed diagonally across the grain with sidewise-sliding strokes. True with a fistter gouge and

Straps appear to gross over others when they are beveled. Stop outs are made along upper straps.





level with a flat chisel. If necessary, deepen the edge cut of the raised section with a veining gouge.

What is done for edge coves? Gauge guide lines on the face and edges, and chamfer with a flat chisel. Then gouge out the coves. Note the stops near the bottom edge.

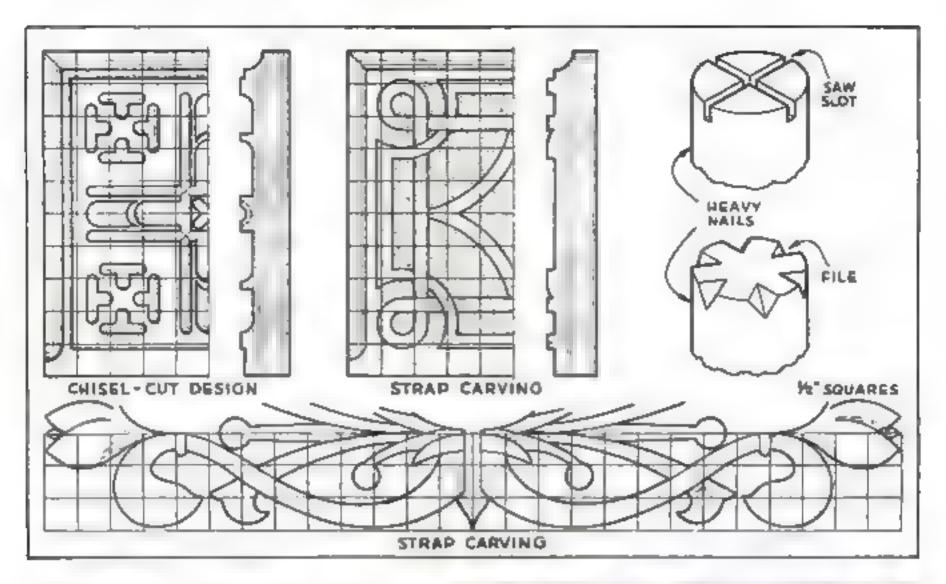
Should pencil lines be sanded off? Use a pencil craser. This keeps the edges sharp. Then sand, using a hard backing block.

Is the strangoork book end more difficult?

Grounds stippled with a stamp or punch are given a testure that contrasts with the raised design.







Only slightly. Lower the ground as was done with the border of the other book end, or rout in a drill press to save time after outlining the straps with a veining gouge. The effect of one strap passing under another is obtained by beveling it smoothly down toward both edges of the upper strap. Make a stop cut on each side of the upper strap and trim the other with a flat chisel used with a shearing cut. If possible, carve with the grain across straps that run at right angles to the grain.

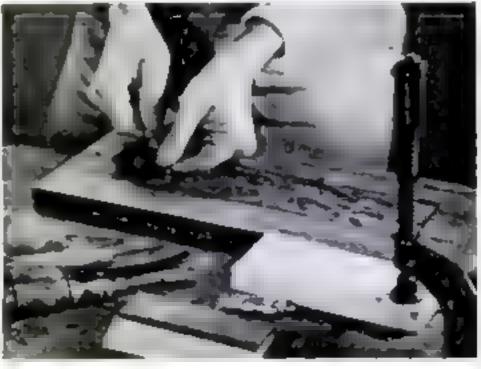
How is ground stippling done? Punches made like the two shown in the drawing are used. Ground stippling is a final leveling that gives a textured ground contrasting agreeably with the

raised design.

Is floral strapwork different? The execution is much the same. A panel like that shown at the right is outlined with a veining gouge. Cuts are taken with the grain in one direction, and then the piece is reversed for cuts in the opposite direction. A V-veiner and narrow flat chisel are useful for trimming corner pockets.

Can strapwork treatment be varied? One side of the panel shown has been given a crossover treatment, while the other has been outlined with a V-tool.

The piece can also be left as completed when the ground has been sunk. Such flatness gives the effect of a thin acroll-sawed piece glued to the ground, especially when the wood is without prominent grain. The ground can be left gouge-flat, it can be tex-



Grounds for strapwork are gauged or routed out. The strape are outlined first with a veining gauge, as in the photo above. Crossover straps are shown on one side of the panel below, autlined straps on the other.



tured with small gouge cuts, or it may be stamped with a punch.

Is color suitable for carvings? Painted grounds and varnished patterns are effective, or polychrome treatment is good if the colors selected are harmonious and subdued.

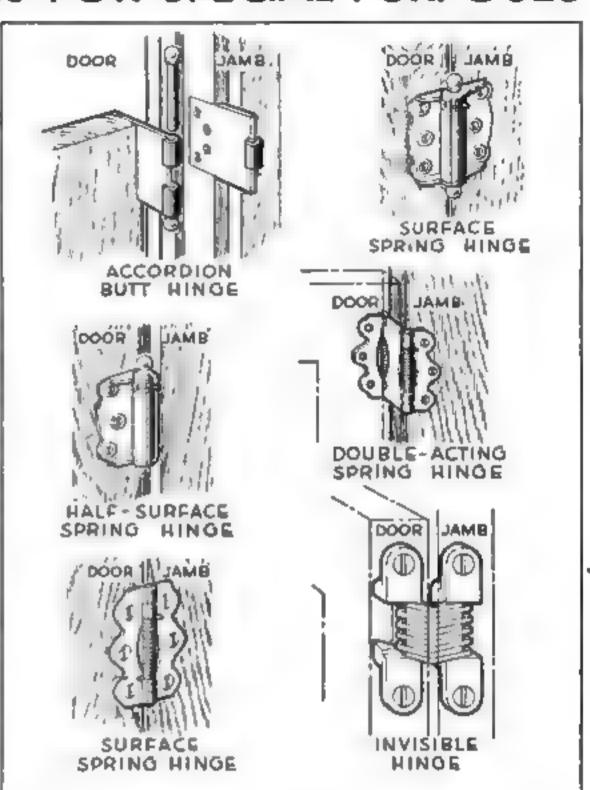
DOOR HINGES FOR SPECIAL PURPOSES

styles other than the strap and butt familiar in all home workshops. When glass doors are to be fitted with drapes, for instance, according butts are used. These have wide leaves that set the pivots well out and hold open doors away from the casings to leave clearance for curtain rods. Similar hinges, called parliament butts, are used on casements swinging inside.

Invisible hinges have a series of folding leaves and lugs set into mortises. They are hidden when the door is closed.

Surface spring hinges serve on flush screen doors. Some have holes into which a pin can be shifted to adjust tension. Those without adjustment are likely to let a door stand open a little after the springs weaken with wear. When a door is hung on a jamb having a projecting molding, as in a stucco wall, a half-surface hinge is required, one leaf on the door and the other mortised at 90 deg. in the jamb.

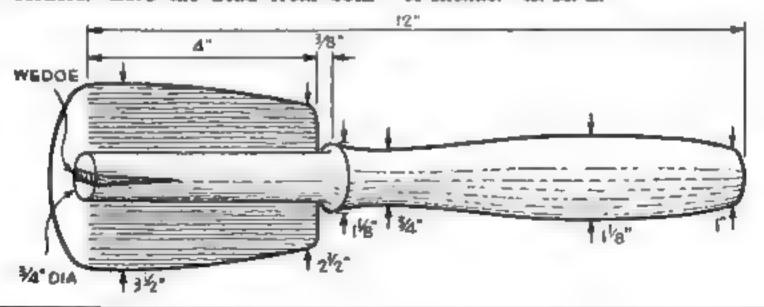
Double-acting hinges are for doors that swing both ways. The leaves go on opposite door and jamb faces.—E. M. L.

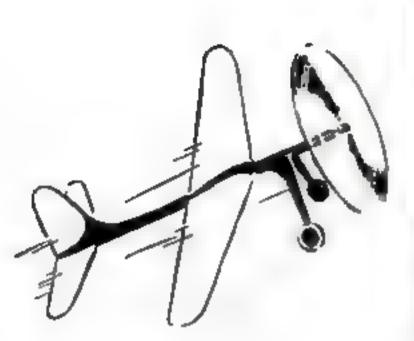


Efficient Wood-Carving Mallet Turned from Oak

ROUND mallets are particularly favored by wood carvers, for they can strike the chisel with any face. They should be turned from oak or other hardwood.

Taper and crown the head and round the corners. Bore the head from both ends to assure centering. Turn the handle to a snug fit and saw a kerf 1%" deep in the end. Drive the handle in until it binds, drive a hardwood wedge into the kerf, and cut flush. Finish with a coat of shellac.—E. M. L.







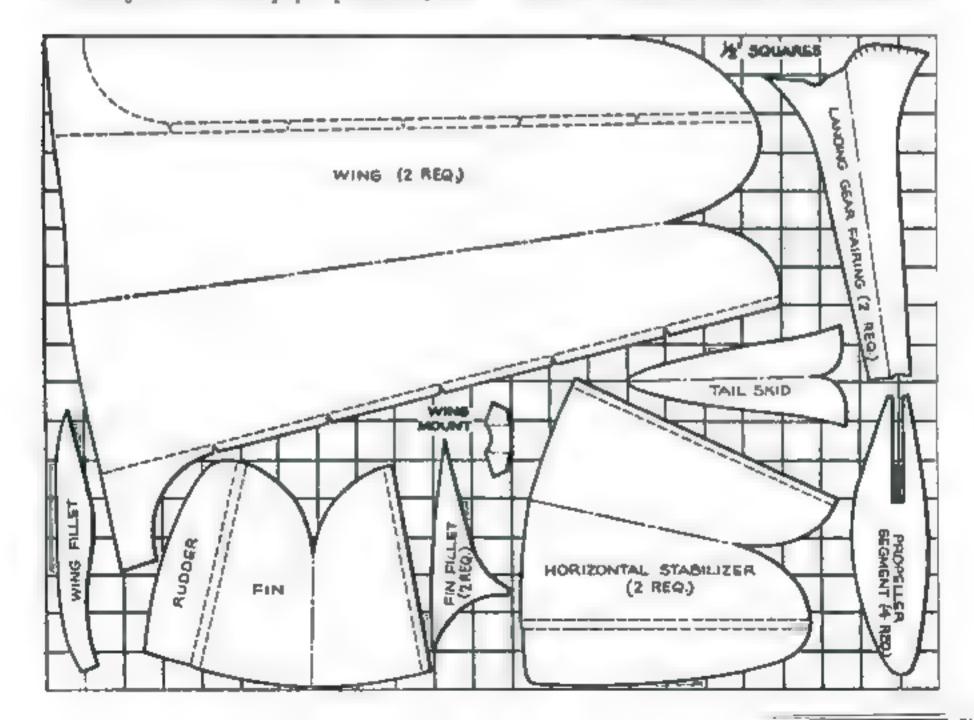
By H. A. THOMAS, Jr.

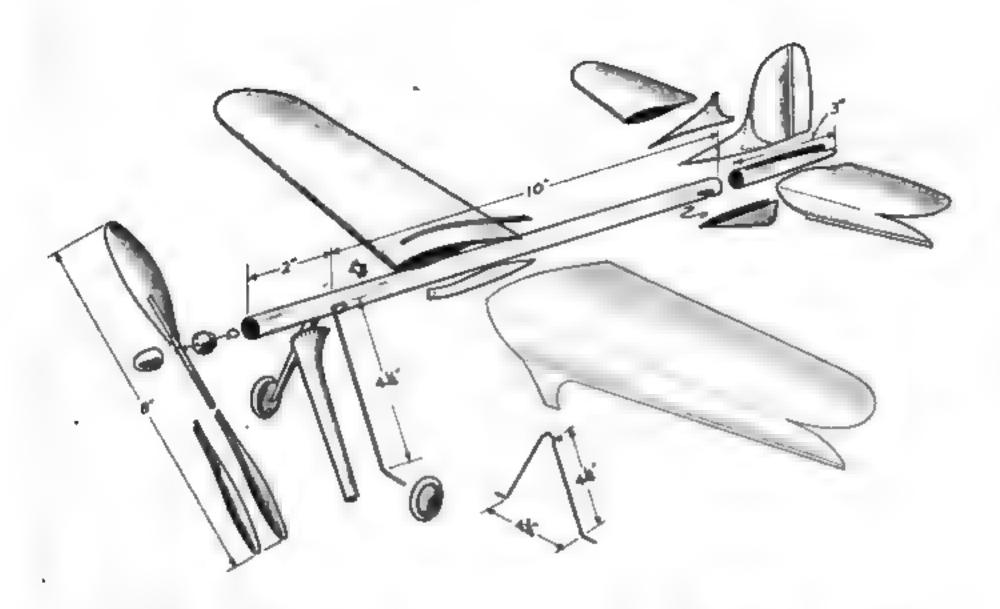
NE of the bad things about a good thing is that it sometimes keeps us from looking for something better. Take model materials, for example. Balsa has long ruled the flying-model field because of its light weight and relative strength. So long as balsa was freely available, even its most vocal critics did very little in the way of investigating the properties and peculiarities of substitute materials.

Then came the era of shortages and modelers were forced to look around. Using heavier materials, it was sometimes found necessary to add small paper parts here and there as a way of minimizing weight. The successful use of paper on these wartime models brought attention to its surprising possibilities. It has limitations, of course, and these must be understood from the beginning.

Improperly used, paper is weak and filmsy, but if it is shaped into tubular, box, or channel form, it is quite strong enough for our purposes. The secret of a successful paper plane lies in the use of good-quality stock. Two-ply Bristol board meets most specifications. Several layers held together with library paste produce a tough sheet; model cement is used for seams and joints.

The 12" motor tube and 3" tall section of



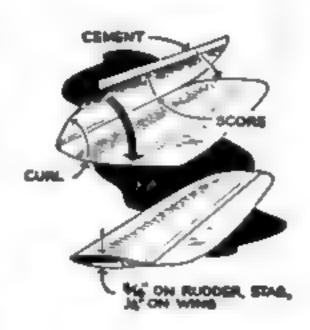


the fuselage of this paper model can be made separately or in a single operation. In the latter case you will need a 6" by 15" piece of drawing paper. Roll the sheet around a waxed 🔏 " dowel, applying library paste liberally. When dry, the tube may be alipped off the dowel, lightly sanded, and doped. Cut it into one 12" and one 3" piece with a fine saw. With the same blade cut the opening for the rear book and the long

notches for tapering the rear section.

On a grid of 1/4" squares, lay out wing and tail-group parts. Curved surfaces can be curled by pulling them over a table edge. To get the clean bends needed at the leading edges, score the paper heavily with a sharp pencil on the inside of the bend. The dotted alieys on the drawings show where the cement is to be applied for joining the upper and lower edges. Severe warping may result from any misalignment of this seam.

Cut four propeller segments and join them in pairs with library pasts. Before the pasts sets, shape a ¼" camber in each blade and form the twist which reduces the pitch of the blades toward the tips. A ¼" by 3¼" dowel is used to connect the two blades of the propeller. Bend the wire shaft around the dowel and attach a spinner made of balsa or other wood scrap. Next, cement



the blades to the dowel at an approximately 45-deg, angle. Finally, taper the dowel ends flush with the blade surfaces and sand and dope the unit several times. Carve the nose plug—also made of wood—to a tight fit in the motor tube. Attach the propeller and install a four-strand rubberband motor.

Assemble the parts as indicated in the pull-apart drawing above, using cement sparingly. The wire

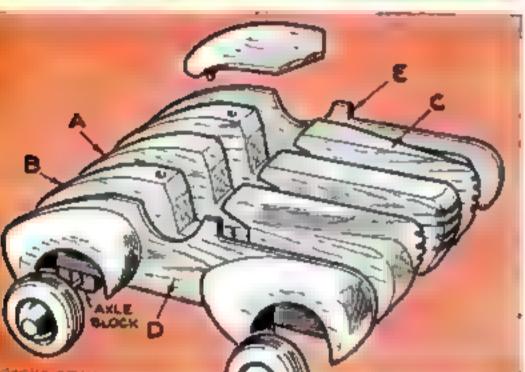
landing gear should be cemented in place and fitted with paper fairings. Pin the wings on to test the balance, then butt-join and cement them to the fuselage by means of the wing mount and the two wing fillets. Be sure to have the wing tips 1 ½ " higher than the roots to insure enough dihedral angle.

Fairings, motor tube, and propeller may be finished with colored dope, but the other parts had best be left alone because paint or dope may warp the paper. When the wing tips are lightly balanced between the fingers, the plane should hang level. If it doesn't, add a bit of modeling clay to the lighter end. Minor adjustments can also be made by bending the trailing edges of the rudder, stabilizers, and wings.

Fly this model as you would any other. If you don't try to use it in damp weather, you should find it a durable, capable flyer.

TOY ROADSTER BUILT FROM WOOD





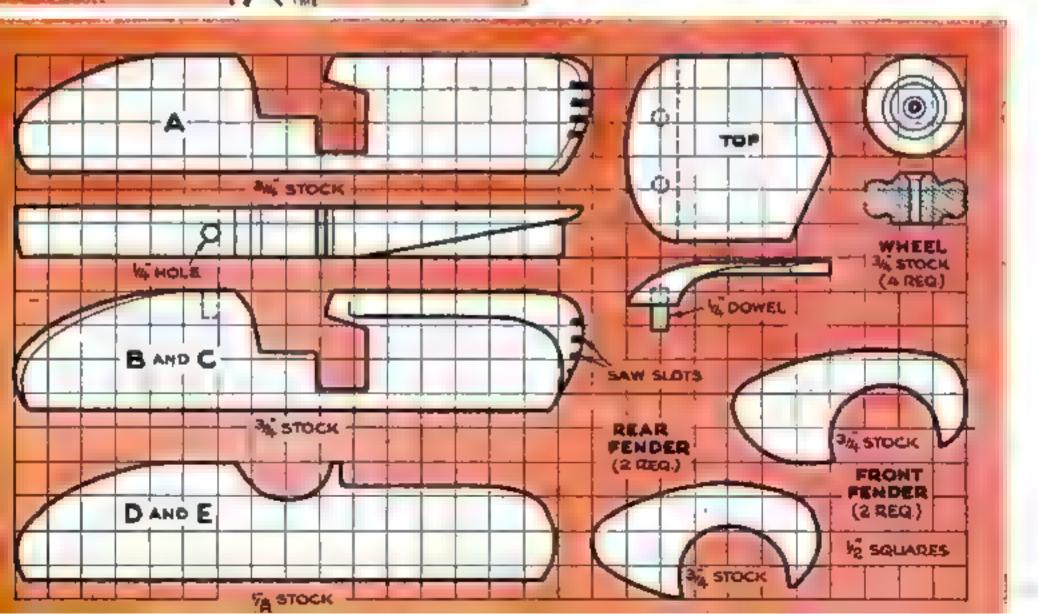
HREE blocks of &" white pine or other soft wood and two of 1/4" stock make the body of this toy automobile. Lay out the profiles carefully and saw the blocks to shape on a bandsaw or jigsaw. Make a trial assembly of the 🐒 " blocks, holding them with light nails, and file the seat alots if necessary to align them. The kerfs representing the radiator grille can be sawed during this assembly, but save tapering of the bood until the fenders have been put on. This can be done by hand with a backsaw and a rasp. The fenders help in alignment.

Shape the fenders as nearly complete as possible before assembly. Then glue all parts to-

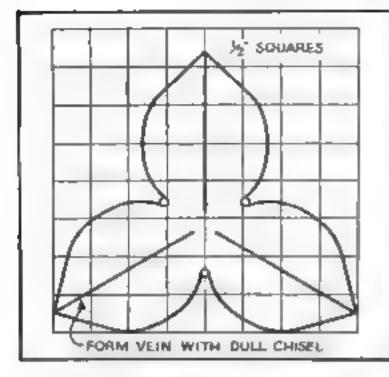
gether, holding them with thin nails driven through the fenders until the glue has set. The nails are then drawn out, the holes filled, final shaping and sanding completed, and axle blocks glued on.

Turn the wheels as indicated in the drawing and drill them to revolve freely on nails driven into the axle blocks. The top is whittled to shape and held with dowels.

Bumpers may be any flattened tubing or metal strips drilled and attached with screws. Windshield and hood trim are tincan stock cut into thin strips. Switchboard-lamp caps, available at electric and radio shops, make excellent head lamps. Finish with good enamel.—H. R. CORRY.

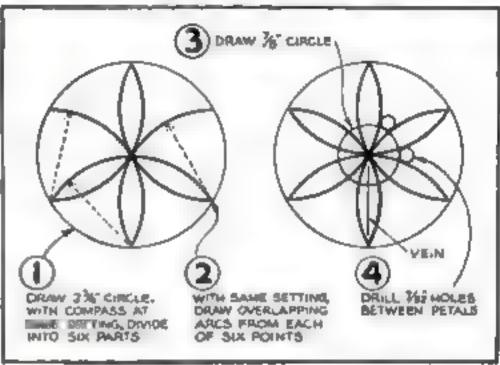


Candleholders in Floral Designs Formed from Sheet Copper





CANDLEHOLDERS in attractive floral designs can be cut and bent to shape from 22-gauge soft copper. off two sections as shown. drilled between the petals make a neater job of cutting out the parts with tin snips. Indent the veins with a dull cold chisel, rub down both parts with coarse steel wool. and mark the veing with black India ink. A %" steel rod will facilitate bending up the small petals. Drill a hole in the center of each piece and fasten them together with a machine screw and nut. Bend down the base petals slightly.-Walter F. Desold.



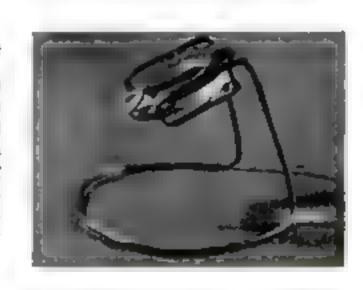


Veneer Card on Name Plate

MOUNTED on a tapered block of well-sanded hardwood, a bit of veneer makes an impressive title card for a desk name plate. The name may be hand lettered or, if you wish, a printer will do the job at small cost. Fold a piece of clear sheet acetate around the title card before attaching it with two upholster's nails. The plate shown is a 1%" by 5" piece of birch veneer on a 2" by 5%" wainut block tapered from %" at the base to %" at the top.—LECIL J. SLABACK.

Lens Holder Bent from Piece of Wire

BENT to shape from a single length of wire, this lens holder has a viewing angle of about 60 deg. from the vertical, a position often more convenient than the usual 90-deg angle of table magnifiers. However, the lens can be placed in a horizontal position simply by changing the angle of bend between the uprights and the lens. Spring tension holds the lens in two wire rectangles. The height of the holder will depend on the best working distance of the lens.—ROBERT SCOTT.



ANCHOR STRIP CATCHES PULL ROD

KEEPING

O

You can save your youngsters as well as your linen from harm by building into your chests on automatic lock operated by the top drawer. Make the parts of "i" plywood to whatever size is allowed by the chest itself. Use loosely pivoted wood screws for all joints so that opening the top drawer will permit the catches to fall of their own weight. Sand all contact surfaces.

If your loose phonograph records are hard to find and easy to break, keep them safe and handy by gluing individual folders inside the covers of your albums. An alternative method is to hinge the folders with stripe of wide adhesive tope. For safety's sake, don't add more than two extra records to any album as this may make the volume too bulky and increase the possibility of domaging the records.

1/2" PLYWOOD

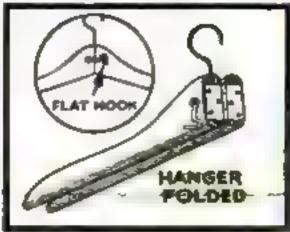
Rosebush thorns make it difficult to cut the flowers as you'd like, but you can outwit them by using a spring clothespin to hold the stem while you ply your scissors.

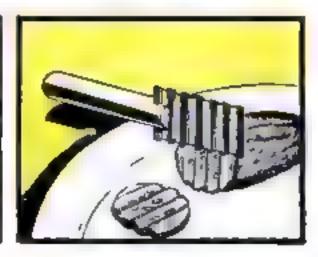


Coat hangers will take less room in crowded suitcases if you cut and hinge them at the center as shown. A flat hook placed across each hanger locks it when open.

Ordinary corrugated fasteners can be used to slice pickles, alives, and similar delicacies for use in fancy salads. Hammer the fastener into a dowel or a wood strip.



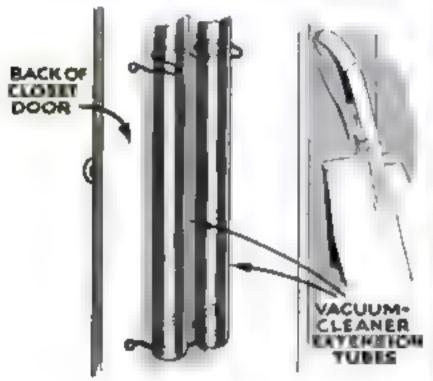




THE HOME SHIPSHAPE



To loosen a paint-jor cap that is stuck tightly, rotate it over the flame of a motch. One or two matches should suffice. Use a cloth to grip the hot metal. Repeat the treatment if necessary.

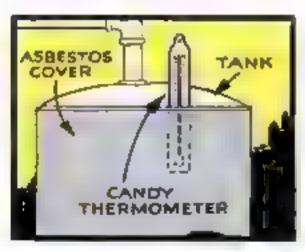


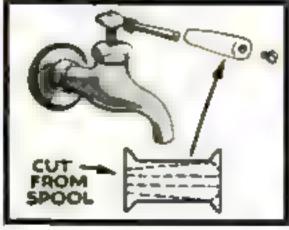
Clips made of coat-hanger wire and nailed to the back of a closet door will keep vacuum-cleaner extension tubes within reach. Bend the wire as shown in the drawing. To obtain a snug spring fit, use the tube itself as a pattern for making the clamp.



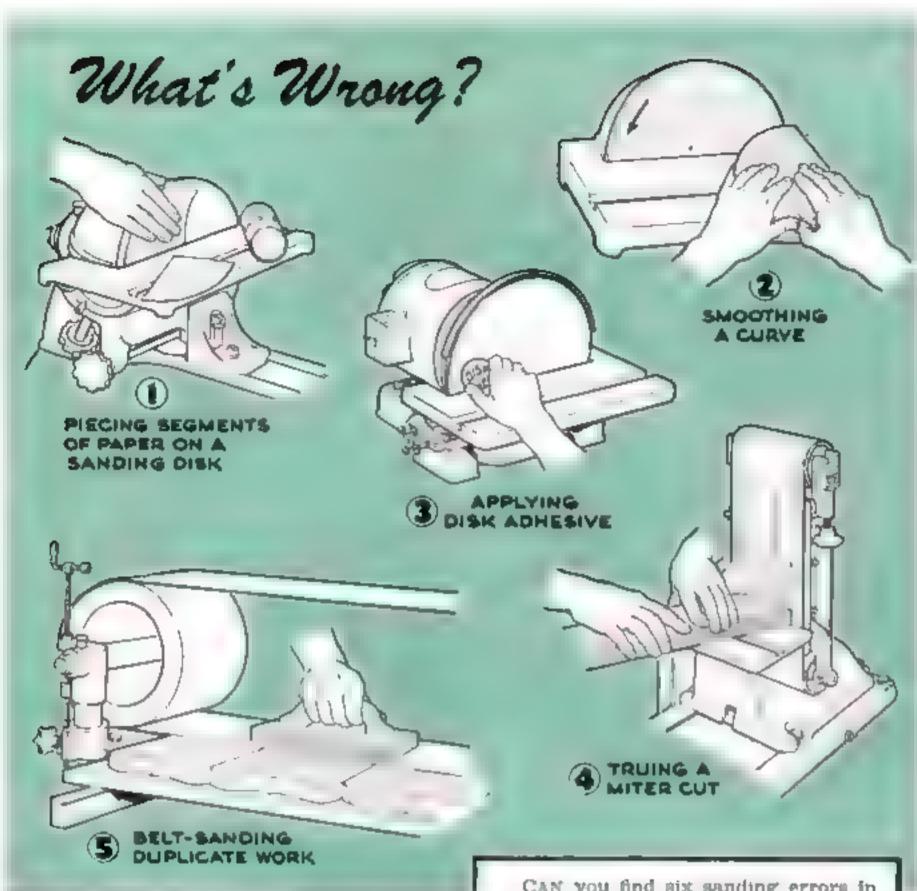
Instead of bringing up an extension light or finding someone to hold a lamp when you want to drive a noil in a dark corner, punch the noil through the center of a scrap of white paper and hammer away. The paper will provide enough contrast for vision.

Inserting a glass or metal-backed candy thermometer under the cover of your hot-water tank will enable you to keep a check on the temperature of the hot water. If you need an emergency replacement for the parcelain handle of a kitchen faucet, shave the edges down on a large thread spool with a jacktnife or rasp. After applying paint with a spray gun, insert a pipe cleaner in the reservoir tube to keep the passage clean for the next use and to prevent clagging of the tube.











CAN you find six sanding errors in the drawings—two in No. 4? The correct answers are given below.

5. Sanding across the grain scores the stock. Take care to arrange the prens with the prens to the motion of the belt.

t Here are two errors, Mever true in and the grape or burn the wood and clog the grit

evisedba batlem to

atick resting on a block of wood This stick resting on a block of wood This stick resting of the table with blobs

2. Do most sanding at the side where the disk travels downward and keeps the work from 1 s 1 g Sand on the up' and only when a shoulder requires it

I. Pieced disks applied directly with affick adhesive will be thrown off. Back the joints with pasted cloth or strong paper, and then apply the assembled sheet in the usual way

How to Go Aloft Safely

By ELON JESSUP

ASTHEAD watch for whales may be a thing of the past, but sailors are still called upon occasionally to go aloft. When gear has fouled and can't be cleared from deck, or an old halyard has let go and a new one must be reeved through the block, there is nothing else to do. This is true, too, when a mast must be cleaned and varnished.

And the masthead watch itself is staging a comeback. Not for whales, to be sure, but rather for big-game fishing and distant cruising on inland waters. A scarcity of markers and the presence of underwater obstacles could get a boat into trouble if it weren't for the masthead watch.

Methods of going aloft have always been curiously varied, but the essentially practical ones for average pleasure boating number only four. One is skinning up bare shrouds; another, shinning up the mast; a third, using a bosun's chair; and the fourth, walking up rathines.

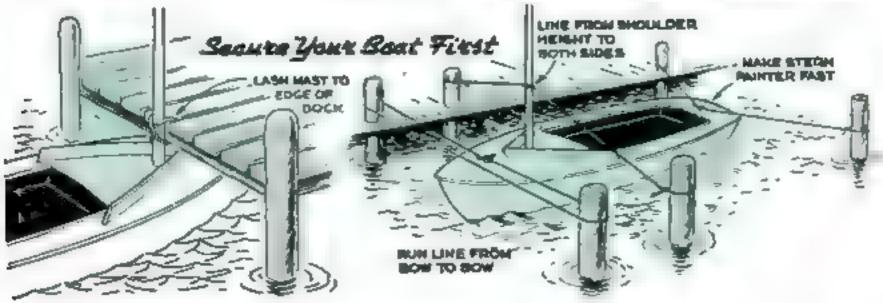
Any Down East deep-sea fisherman can show you how to skin up a pair of bare shrouds. Nowadays the fishermen don't practice this method so much, for the modern fishing dragger's shrouds are usually rathined. Climbing unrathined shrouds has actually become more suitable for pleasure craft—something plenty of yachtsmen haven't overlooked.

The knack constate largely of squeezing

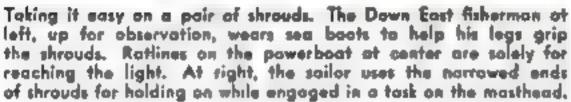
\$500 in War Bonds TO HELP YOUR SHIP COME IN

PRIZES for the best ideas about the boat you want to own. See page 172.











the inner side of the foot at the toes and the outside of the knee against the wire or rope. Then the shroud crosses over the foot and in front of the leg. Overhand reaches for more altitude take care of the rest. Fishermen usually climb in their sea boots. The rubber helps their legs to stick.

Given the choice between shrouds and a smooth mast, fishermen take the shrouds every time. Many an owner of a small to medium-size sailboat will prefer the mast.

Make sure before starting up that your boat can take it. The mast becomes an upturned weighted pendulum, and a small boat is likely to roll and may even tip over. If you have any doubts, nose her beforehand between a spile and a wharf, and then run a line to each side from the deck or low on the mast.

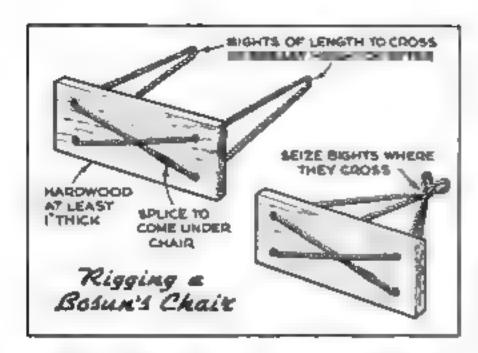
You will usually have a halyard to serve as a convenient handhold while climbing, or you can grasp the shrouds of a narrow boat. There is an old custom on deepwatermen that is worth bearing in mind, if you live on salt water. Try going up a mast barefooted after first dipping your feet in salt water and letting them dry. A coating of salt will remain and will prove a help.

Circumstances often dictate the most suitable method of going aloft. A case in point is the famous and familiar rig known as the bosun's chair. Don't try one in a seaway. Most sailors concede now that swinging in a bosun's chair in a seaway is doing a job the hard way. The bosun's chair belongs in port for jobs like painting.

Aloft in a bosun's chair in its proper place, you will probably be more firmly seated than appearances suggest—but only if the seat is solid hardwood at least 1" thick, if the halyard and block can be counted on to hold you, and if the supporting bridle is adequately rigged on the seat. Criss-crossed lines under the seat are recognized as the safest rigging, for then, in the untoward event of the seat splitting, you will be left sitting on the lines.

Usually the occupant of a bosun's chair is hoisted and lowered by a shipmate on Hoisting and lowering yourself is possible, but hoisting especially is not to be recommended. No matter which way you go, though, remember the old saying: one hand for the ship and the other for yourself. You can't know for certain the strength of the block aloft until you reach it, but you can keep a leg hold on the mast and one hand on a shroud or stay. A sail stop encircling your body and the mast isn't a bad idea. You can become so engrossed in a job of cleaning the spreaders or varnishing the mast that you may not notice a powerboat kicking up a considerable wave across the harbor. That kind of thing can swing a bosun's chair out and slam it back with a wallop that could seriously injure you even if it didn't unseat you.

For general fitting-out in port you may

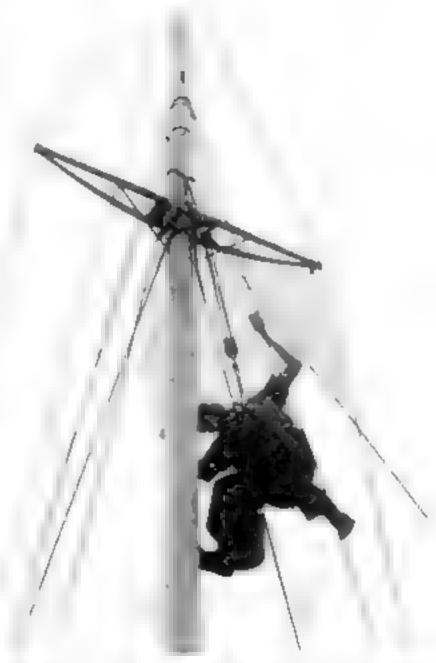


require a bosun's chair, but for observation outside and for reaching gear, rathes are the safest, most comfortable, and most generally satisfactory means of going aloft. The shrouds are already there and, once installed, rathings eliminate the fues and bother of rigging up a bosun's chair.

A good many of the new sports fishing boats carry rathines, and occasionally, too, you will find them on powerboats solely for the purpose of reaching a light. Large yachts, of course, have been carrying rathined shrouds ever since anybody can remember. They are out of place on small sailboats, but they can prove of special value on medium and large ones. Although a certain amount of windage is inevitable, it can be halved by installing rathines on only one side of a boat.

Pleasure craft once almost invariably used rope rathines, but recently a number of them—especially powerboats—have taken to wood and pipe. You may prefer the appearance of rope, but wood or pipe rathines offer firmer and more comfortable footing.

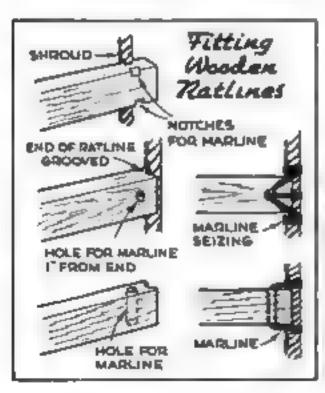
If, in spite of this, you must have rope, use a light, tarred, 12-thread line %" or more in diameter. Lengths are cut to conform to the spacing between the shrouds with enough extra allowed for making the



Aloft in a bosun's chair belayed to the deck, the seamon here employs one hand in work on the most while keeping the other on a shroud for safety.

ends fast. Long rathines can be shortened by twisting, but short ones can't be lengthened. To determine the number, figure 15" to 18" as a comfortable climbing step.

Before attaching the rathines, or even cutting them, serve the shrouds with tarred marine or a few rounds of spun yarn to keep the rathines from slipping. Friction tape can be used, but it doesn't look so well. You should also seize on a number of strong temporary battens to hold the shrouds rigid,



Wood rations are often notched near the ends, as shown below. The notches hold the turns of marline in place, as at right, when the rationes are seized on the shrouds. Spun-yarn servings on shrouds prevent slipping under weight.





Staut ratines are the safest and most generally satisfactory means of going aloft. Here a sailar stands on one ratine to make another fast above.

support you as you work upward, and enable you to get correct measurements between shrouds as well.

Rathines may be attached with a clove hitch, but the more usual method—and also the more presentable—is with an eye splice. In either case, the knot is seized to the shrouds with rounds of marline. If you have a series of shrouds to deal with, use eye splices for the two outside shrouds and clove hitches for those intervening. The hitches must always face outward.

Any material used for wood rathines should be sturdy hardwood that will take the tread of a heavy man in a rolling seaway. Rungs from a ladder are sometimes used. Down East fishermen go for oak 1" square. They set a sound example.

Serve the shrouds first with tarred marline or spun yarn, as in rigging rope ratlines. You won't need temporary battens.
Methods of attachment vary. One is to
notch the front and back of the rathnes
about 1" from the ends. The notches on
the back anug into the two shrouds, and a
simple seizing on with marline takes care
of the rest. Notches are not so essential on
the back, but those on the face keep the
marline from slipping off

Another way is to cut grooves in the ends for the shrouds to fit into. Rathines grooved this way do not overlap. Drill a small centered hole through the face about 1" from the ends, put several turns of marline



through, and seize around the end of the ratline and above and below on the shroud.

Ratlines of pipe are put on with linen seizing and the seizing is then shellacked. The seizing shrinks as the shellac dries and will hold with great strength.

\$50000 in WAR BONDS

Prizes Awarded for the Best Design Ideas by Boat Lovers

Ass you a sait or a fresh-water skipper? Do you like to sail or do you favor power-boats? What is your idea of an ideal boat? Is it a cabin cruiser, a speedboat, a fishing smack, or a ketch or yaw!? Whatever it it, just so it is no more than 35' long. POPULAR SCIENCE MONTHLY will pay for the best ideas.

First Prize \$250 War Bond
Becond Prize \$100 War Bond
Third Prize \$50 War Bond
Fourth Prize \$15 in War Stamps
Sixth Prize \$10 in War Stamps
Ten additional prizes \$5 in War Stamps

You may enter as many designs as you like, but only one prise will be awarded any contestant. Entries should consist of

the following: one or more drawings, which may be in pencil; a description in not more than 500 words; an estimate of cost, stating whether the estimate includes only materials, materials and labor, or purchase price if it is the boat you'd like to buy; a declaration that the design is original with the contestant. Be sure to state what you wish to use the boat for.

Send entries to the Small-Boat Contest Editor, Popular Science Monthly, 353 Fourth Avenue, New York 10, N. Y., bearing a postmark not later than November 30, 1945. The contest is open to all except naval architects, professional boat builders and designers, employees of this magazine, and their families. Duplicate prizes will be awarded for thes. The decision of the judges will be Snal.

Aircraft Metals in the Home Shop

By WALTER E. BURTON

NE of the most pientiful metals in the postwar period is likely to be aluminum. It is bound to find its way into the home workshop where the craftsman will, in many cases, prefer it to steel and other metals because of its cheapness, strength, and lightness, and because of the ease with which it can be worked.

Aluminum melts at 1,220 deg. F. Scrap pieces can be melted in a crucible in almost any kind of furnace and then cast in sand or iron molds. Aluminum for casting is generally alloyed with about 8 percent copper. Another aluminum alloy, especially suitable for gears and other cast parts for salt-water craft, contains silicon and a trace of iron. One small shop, using broken-up auto-engine heads and similar scrap, had trouble getting clean-cut castings until a little scrap zinc was added. Common alloys weighing a third as much as brass have a tensile strength of about 20,000 lb. per square inch. Cast aluminum and soft sheet are rated at about 15,000 lb.

An abundance of airplane scrap and surplus materials promises to make duralumin a common word in almost every shop. This important alloy is about 95 percent aluminum with up to 4 percent copper and equal or nearly equal parts of manganese and magnesium. One of its properties is an ability to gain other qualities simply through heat treatment and cold-rolling. Tensile strength can thus be increased to 70,000 lb., as great as that of some steels.

If you should acquire sheet aluminum alloy that is too brittle to be bent without breaking, try annealing it by heating to about 700 deg. F. and then letting it cool in



Stabilizers in cathedral-like array as they await assembly on the fuselages of planes. Home craftsmen may soon be using scrap or surplus aircraft metals.

air. Aluminum is generally heated in salt baths in commercial processes, and the time and temperature are watched carefully.

Spun aluminum makes interesting projects. Bowls and similar pieces can be spun in an ordinary metal lathe. Use a fairly high speed and lubricate the tools with petroleum jelly. Bowls, platters, and the like can also be formed by hammering.

Aluminum oxide, forming naturally in a thin coating on the surface of aluminum, is one of the hardest substances known and is, in fact, an ingredient of some grinding wheels. The oxide makes aluminum difficult to solder. It may be polished off with steel wool, fine abrasive cloth, or prepared aluminum polish, but heat accompanying soldering causes renewed oxidation. A special aluminum solder is required, some makes being used with a flux and some not. Generally the best method of heating is with a torch developing a pointed flame, but soldering irons of nickel are also employed.

Welding of aluminum can be done with a

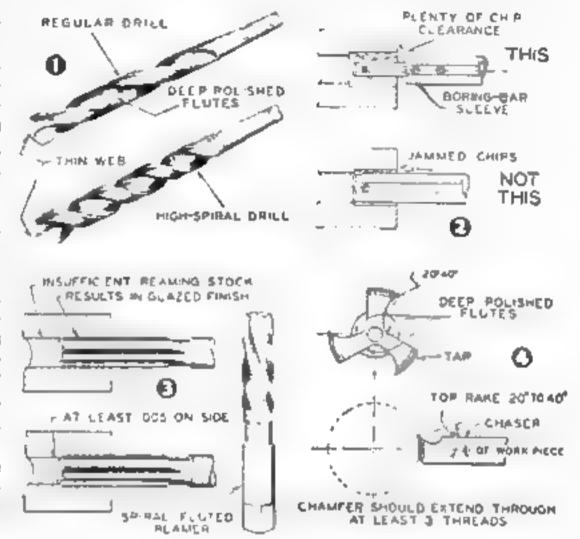
Tips on Machining Aluminum

ALUMINUM may be machined at about the same rate as brass and much faster than steel. Comparatively low speeds are useful in roughing cuts where there is a hard abrasive outer surface, but often the only limit to cutting speed for aluminum is the top speed of the machine itself. The machining tips that follow were compiled with the aid of Blue Chips, a publication of the Operators Service Bureau of the Warner & Swasey Co., of Cleveland. All the drawings are from Blue Chips.

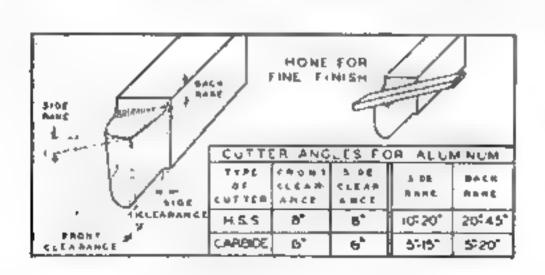
1 Providing for a free flow of chips is the principal problem in drilling, and for this reason a standard twist drill hav-

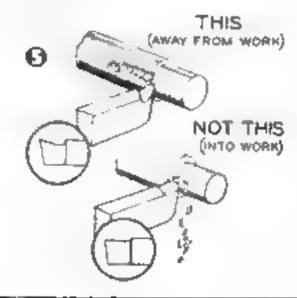
ing polished flutes and a thinned web is generally the most satisfactory. Deep holes are drilled best with a bit having a high spiral angle. Such a drill cuts freely and has more chip room in the flutes. Drills must be kept sharp.

- 2 As much clearance as possible is essential around a boring bar to keep chips from jamming. Since the chips are work-hardened, they can spoil the finish.
- A reamer must actually cut aluminum because the metal is spongy, so enough stock must be left to keep the tool from squeezing and burnishing the work. Spiral-fluted reamers have a free cutting action and are often used. They should be properly ground. A speed as high as 400 surface feet per minute is possible.



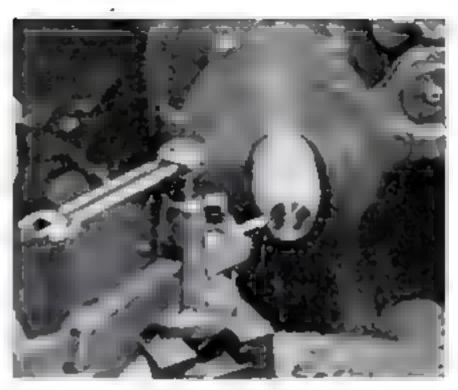
- 4 Care is required in tapping and threading. Use ground-type taps with a "hook" or rake on the leading edge of the flutes. The flutes should be deep and wide to provide chip clearance and avoid jamming that may ruin the thread. Both dragging and forcing a tap or die head may destroy the accuracy of the lead.
- 5 Lathe bits for machining aluminum are ground differently from those used on steel. A table of clearances and rakes is given in the drawing. For a good finish, the chips must not drag on the previously machined surface. Aluminum can be machined dry. If a lubricant is used, it may be a mixture of soluble cutting oil and water, kerosene and lard oil, paraffin (oil) and lard oil, or water or kerosene alone.







Haning the cutting edge helps to keep tools sharp for machining aluminum. As in lathe work on other nonferrous metals, keep-edged tools are required.



Aluminum is machined at high speeds, from 200 to 900 surface feet a minute. Note that the tool is set quite high and meets the work at a steep angle.



Sheet aluminum is being spun here in an ordinary lathe fitted with a ratary tailstock center. Do not try heavy spinning in a small precision lathe.



Dipping in the gives aluminum a satis finish. The piece shown above is the aluminum lens cap being turned from a costing in the photo at top right.

torch when a suitable flux is used. Butt joints seem to be the most successful. The flux, as in all welding and soldering, should be washed off after the operation.

Aluminum articles are polished readily and require no special finish. They can be lacquered or enameled, Crackle and wrinklelacquer finishes are common.

An even, satiny matte can be produced by alkalis, as was found some years ago by the head photographer of a large manufacturing concern. He had experienced difficulty in obtaining reflectors for 500-watt lamps and had tried to use aluminum mixing bowls mounted on wooden supports, but they were so shiny that the distribution of light was uneven. Knowing that alkalies attack aluminum readily, he mixed a strong solution of household lye, swabbed it around inside the bowls, and let it bubble and fizz for several minutes. Washed in water,

rinsed in his acetic-acid short-stop bath, washed again, and dried, the bowls became excellent diffusion-reflection mediums. Alkaline solutions such as ordinary lye (sodium hydroxide) and potassium hydroxide are also employed in etching aluminum.

Magnesium is another important war metal likely to find favor in home workshops when extreme lightness is desired. It weighs only 109 lb. per cubic foot compared to 168% lb. for aluminum. The melting point is slightly lower, 1,200 deg. F. Magnesium may be machined like aluminum, but the metalworker should bear in mind that fine shavings and chips will burn with a fierce heat—the flash powder used by photographers before the advent of the photoflash lamp was chiefly magnesium.

Monel metal, an alloy containing a little better than 2 parts nickel to 1 part copper and a small quantity of other elements, is



Sulphurized cutting oil is a help in drilling tough monel metal. Without it the bit may be burned. A deep punch mark encourages the bit to take hold.

one of the tough guys of the alloy world. It melts at 2,460 deg. F., has a lustrous, silvery appearance when polished, has high ductility and malleability, and resists corrosion. Some of its uses are for photographic tanks and trays, for air ducts and other equipment in factories handling salt and other corrosives, and for kitchen sinks, stove tops, work surfaces, and the like.

Its toughness makes monel sheet difficult to cut with hand snips, though if the necessary force is applied it can be done. A drill bit is likely to burn without warning when you attempt to drill monel unless you employ a trick or two. One such trick in drilling sheet stock is to make a deep punch mark first, one even deep enough to break through, which helps the drill take hold

Old Photographic Hypo Useful for Silver-Plating Brass

THOSE who do their own film processing have a means at hand for silver-plating brass knobs, ash trays, candlesticks, and the like. They can use their old hypo. All that is necessary is to clean the surface of the brass piece to be plated to remove all dirt and grease and to immerse it in the hypo for a short time. The plated piece is then washed well, dried, and given a coating of clear lacquer to prevent tarnishing.

By a process known as chemical displacement, a thin coating of silver is deposited on the brass. This usually requires no more than a minute. Prolonged immersion may result in flaking. Be sure you employ used hypo, or there will be no silver in it.—W.E.B.

promptly instead of merely rubbing over the surface. Sulphurized cutting oil or lard oil is applied to reduce friction and produce a cleaner cutting action. Dry-cleaning fluid, applied liberally enough to prevent complete evaporation by the heat of drilling, will also work. Use a slow drill speed with just enough feed for a nicely curied ship.

Monel can be spun successfully, but it calls for more force than brass, copper, and even many steels. Whenever it becomes too hard and stiff to be spun, it should be annealed by heating to 1,440 deg. F. and cooling in air. Tallow is a good spinning lubricant, and the tools are preferably steel,

Welding, soldering, and brazing monel are not difficult provided the surfaces to be joined are clean. For soft-soldering, the best procedure is to tin the surfaces, using an iron rather than a torch when convenient, and then to sweat the joint together. The flux may be any preparation having sinc chloride as a base—the familiar zinc dissolved in muriatic acid will do, and various commercial fluxes are satisfactory. After the job has been completed, wash off the flux with hot water, scrubbing with a cloth or brush if necessary.

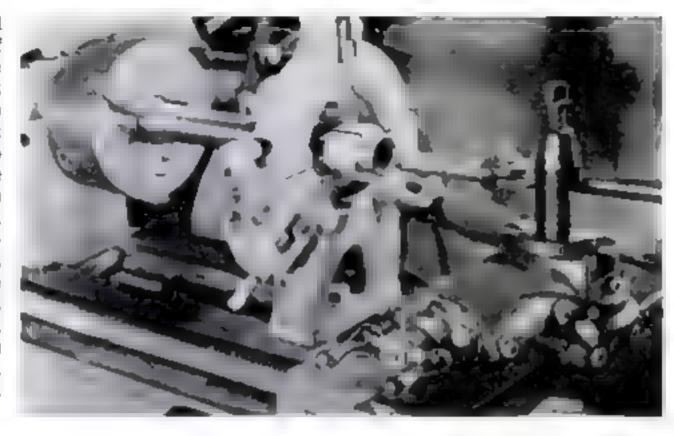
For hard-soldering, use a sliver solder melting at 1,400 deg. F. or less and a torch with a small flame. Keep the torch moving so as not to heat the metal any more than necessary to make the solder flow. The same procedure is followed in brazing. Special fluxes for monel are made for both hard-soldering and brazing. No special brazing rods are needed with the right flux.

Monel may be welded with a gas torch, metallic or carbon arc, or spot or seam-welding equipment. Special monel welding rods are made. The current for spot-welding is higher than that needed with steel, but pressure is lighter and time shorter.



Split Bushing in Lathe Steady Rest Protects Finished Surfaces

MARKING of polished work by the jaws of the steady rest can be prevented by a split brass bushing made up to slip over the work as shown in the photo at right. Adjust the jaws until the work is held snugly but will still revolve freely inside the bushing. Such a bushing protects the surface from chips and dirt and, when well oiled, not only guards against scoring but even increases the high polish,--C. W. W.





Gauge Made from Scrap Measures Tool Height

THREADING and cutoff tools that must be adjusted to exact center or other height in a lathe can be set quickly and accurately with the aid of a height gauge made like the one shown above.

Cut the upright member from scrap bar stock, thread the end, and acrew it into a suitable base. Make up a collar for a snug sliding fit, drill it clear through, and tap one hole for the height bar and the other for a setscrew. If the bent end is cut to exactly the same length as the distance from the hole to the collar bottom, the upright member can be calibrated.—C. W. W.

Section Cut from Broken Triangle Salvages It for Many Uses

WHEN breaks or chips make a triangle worthless for drawing and layout work in its original form, cut off one unbroken side to make another handy lastrument, as shown in the drawing.

Use a penknife and a metal-edged ruler to score both sides where the triangle is to be BREAK IM TRIANGLE CUT HERE 136°

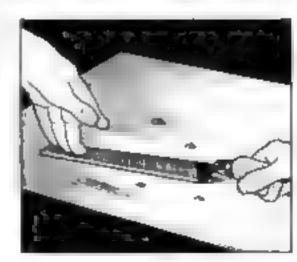
cut, and then break along the line. Sand the top edge to a bevel and smooth the cut portions. Conventional divisions may be scored at the top edge, if desired, and filled with India ink.—F. S.

Offset File Handle for Wide Work

It is often difficult to file a surface with an area wider than the length of the file. Fingers bump the edge of the work when the handle is left off, and uneven pressure causes poor finish. A slight altera-

tion will remedy this.

Slip the handle off and heat the tang red hot; then make an L-shaped bend as indicated in the drawing. Be careful not to heat the cutting teeth. The bend should offset the handle just enough to give finger clearance.—JOHN KRILL



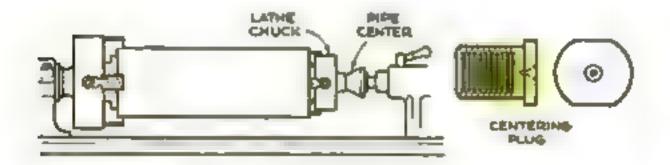
SELF-FEEDING, the device at the extreme right solved the problem of holding threaded stude against a power-driven brush. The stude fall by gravity through a tube set at an angle, and the brush contacts them through an opening cut in the tube. To

keep the stude from passing too quickly, a small stationary brush is mounted to protrude into the tube through an opening opposite the larger one, its friction controlling the time the work is in contact with the rotary brush, which turns each stud until it is past and drops out of the tube.

Such a holding fixture could be made from any metal pipe, but if the part being brushed is soft it would be better to use tubing of plastic or other composition to avoid damage to the external threads. This is one of two handy new shopmade devices for use with power brushes



reported to the Osborn Manufacturing Company, of Cleveland, Ohio. The other is a pair of handmade forceps (at left above) for holding tiny splines against a brushing wheel. A set of such forceps would be useful in handling parts of many sizes and shapes.



three-jaw chuck into the inside of the casing and let it revolve on the pipe center, which is set into the tailstock. A four-jaw chuck on the headstock will support the other end of the pipe

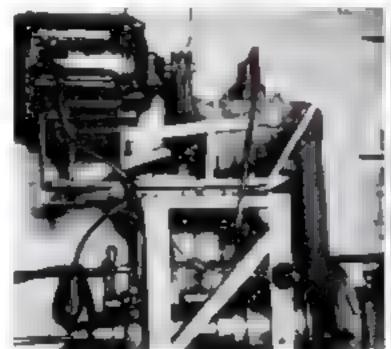
in the usual manner. For repeat work, a threaded centering plug to fit the chuck may be made and a regular lathe center used in place of the pipe center.—R. M. DYKE.

CASING or large pipe too big to mount on available pipe centers in the lathe can be set up securely for turning with two lathe chucks and a small pipe center. Fit the

AN AUTO TRANSMISSION will provide speed changes for a large lathe, James W. Kemp, of Santa Fe, N. M., who installed such a system, arranged a double V-belt drive on the power-input side of the trans-

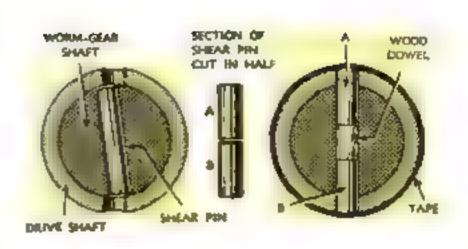
mission by placing a double water-pump pulley on the motor and two pulleys, welded together, on the clutch shaft. On the output shaft he attached a pulley for a flat belt running to the large step of the lathe pulley. He mounted the motor and transmission in a cradle on an angle-iron support bolted to the lathe, Adjustments in the motor mount and trans-

mission support tighten the belts. A pan under the transmission collects any dripping grease. By use of the shift lever, bent down within easy reach, the operator can shift speeds without stopping the lathe,—E. H.

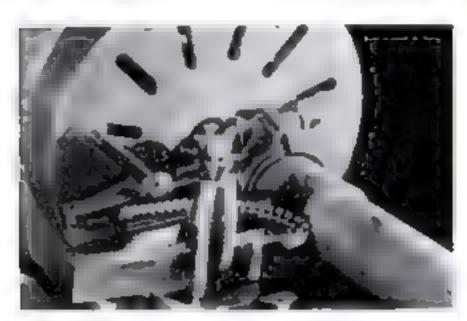




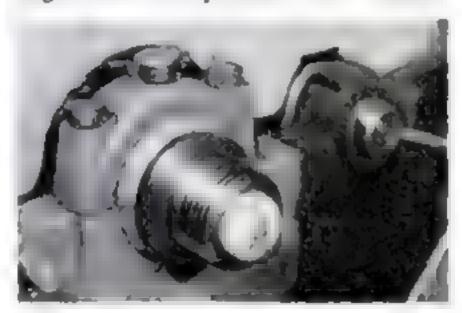
WOOD DOWELS are employed in an emergency method of repairing broken shear pins reported to Army Motors by Sgt. Robert H. Fortin. Punch out the piece of broken pin remaining in the shaft, cut it in half, and space out the two sections with a wood dowel, as shown in the sketch at the right, so that they will withstand the force between the driving and driven members. Friction tape wound around the drive shaft will keep the sections of the pin in place if necessary.

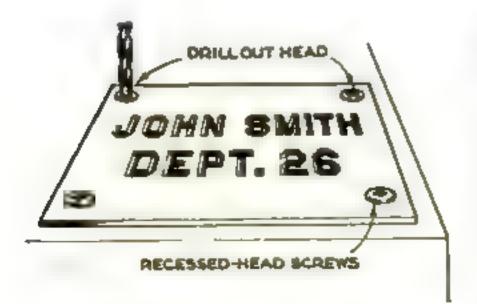


A CORK PLUG for the headstock spindle of a metal-turning lathe stays in place better than the usual cloth or wooden stopper. If it's too large, place the cork in the lathe and turn it down with coarse sandpaper. For easy removal, the plug should protrude about \%". Insert it in the spindle and cut to that length with a sharp knife.—Will Thomas.



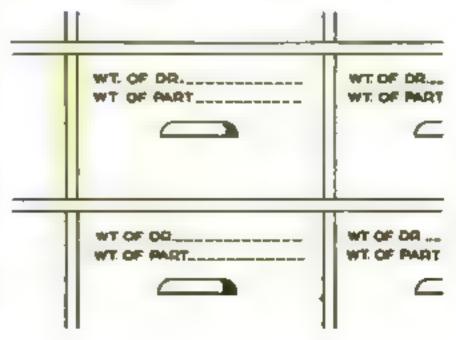
BIG DOG. For oversize work, the makeshift lathe dog shown above will serve the purpose satisfactorily. It was made from a discarded connecting rod with the small end cut off. A hole can be drilled in this end for insertion of a driving stud or a bolt can be fastened in the faceplate stot to drive the lathe dog and the work.—C. W. WOODSON.





DRAWER LABELS like those shown at the right save much time in taking inventory of small parts stored in a stock room, for it is not necessary to count each individual piece. On each card is recorded the weight of the empty drawer and the weight of one of the parts stored therein. Taking inventory thus is reduced to a simple arithmetical problem. Weigh the drawer and its contents, subtract the drawer weight, and divide by the weight of one part. The result is the approximate number of parts.—R. E.

NAME PLATES on tool boxes, trunks, or luggage are harder to remove, and therefore make identification more permanent, if attached with recessed-head screws as at left. When the screws are in place, drill out the four-pointed recess to prevent a screwdriver from taking hold. If removal of the plate may be necessary at a later time, it is best to use machine screws so the nuts can be loosened from the inside of the door or container.—Wallace H. McClay.



TOOLMAKER'S PROTRACTOR IS SET WITH MICROMETER

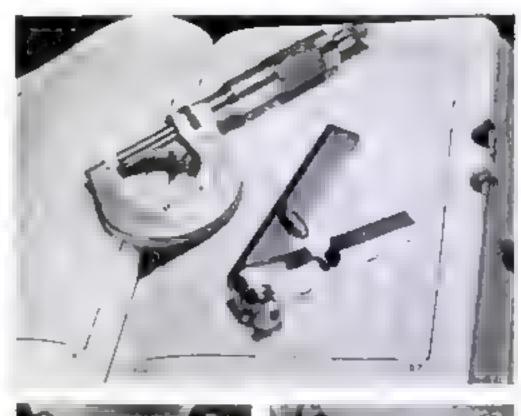
By FRANK McCARTY

DJUSTED like a sine bar, this miniature sine protractor enables a toolmaker to set up small work for milling, grinding, or shaping uncommon angles accurately to the minute of a degree. With the aid of two micrometers and a table of sines from a machinist's handbook, any angle up to 90 deg. can be quickly determined.

The base is shaped from a rectangular block of mild steel, squared up and drilled with a 17/64" hole and drilled and reamed with a 14" hole located as indicated in the drawing. Insert a short length of % " drill rod in the reamed hole for a test plug, and grind the bottom to exactly .150" from the underside of the plug (Fig. 1). This .150" plus the plug or hole diameter (.250") establishes a constant of 400, which must be added to the sine of the angle for which the protractor is being set. The base is completed by trimming off excess stock and filing the 17/64" hole to a notch.

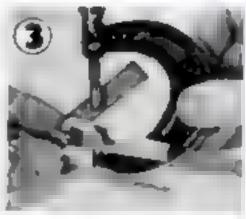
Grind the edges of the arm parallel, and drill two holes, as indicated. A clamp screw serves as a pivot, a keyway in it receiving a 1/16" pin inserted through the top of the base to prevent rotation when the knurled nut is tightened. The button fits loosely on its screw and can be clamped exactly 1.000" from the pivot and on a common center line parallel to the edge. The length setting will be 1.250" between outside diameters (Fig. 2). Make the setting from the edge with a depth micrometer.

Set the protractor by locating the sine of the desired angle, adding the constant .400, treating the figure as inches, and measuring from the bottom of the protractor base to the top of the button, as shown in Fig. 3. A 1" micrometer will measure angles up to 36 deg. 52 min., while a 2" micrometer will carry the measurements up to 90 deg. Figure 4 shows a lathe bit being clamped in a vise with the aid of the protractor for grinding to an exact angle.

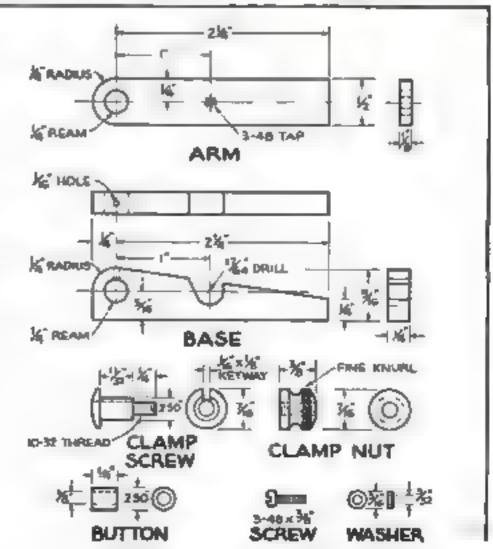










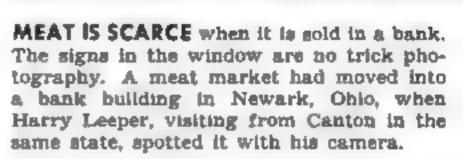


CAN YOU BEAT THESE PICTURES?

We will pay \$5 for any photo used on this page. Write your name and address on each print. Enclose a stamped, selfaddressed envelope and the negative, if it is available, and send your contribution to the Curious Photos Editor.

NO SOLAR PHENOMENON, these rings on the Boston courthouse. They are the result of focusing the camera through the Army's famous ring sight that picks up moving targets accurately. Rainbow rings, produced by light through a lens in the sight, are projected so that they appear to be superimposed on the target.







ICED PIERS that once held an old mill in Bath, Maine, made the odd photo above. With each rise and fall of the tide in winter, more ice is left on the piers until they look like this. Jean MacDonald, of Bath, took the picture.

ANY OLD BOTTLES? Neil Cornwall, a tinsmith, of Vienna, Va., saved a lot of them to build this garage. The bottles were laid in cement mortar like bricks after the framework had been put up. This interesting construction took two years—to collect bottles, not build.



By FRANCES C. SMITH

LMOST every amateur photographer has experienced taking at least one grab-bag portrait shot that turned out surprisingly well. And too often he has been encouraged by it to plunge into portraiture with enthusiasm before he even knew what made that one shot good. The result, in most cases, has been almost disastrous, with Aunt Susan demanding to know what he did to her nose and with Cousin George offended by a rogues' gallery rendering.

Here's what made that one portrait good. By a fortunate coincidence the lighting was just right, the background was not obtrusive, and the shutter was clicked at just the right moment to get a characteristic expression on the face of the subject. The photo thus achieved the two main objectives of portraiture. It was a pleasing likeness and it revealed character and personality. If he had only known, the amateur might have gone ahead to the working of con-

Mko Says

Hardly noticeable in his hand, the stub of a cigar helped this man to relax and to assume a characteristic expression. The background is not as plain as desirable, but a large lens aperture threw it out of focus just enough to make it unobtrusive.

sistent wonders in portraiture.

Well, now that you know, there is no reason why you can't take up portraiture with assurance of success. It's as simple as that, But it does take practice and planning and the memorizing of a few easy rules. There will be discouragements at first, but don't give up. You have before you one of the most fascinating and challenging phases of the whole fascinating, challenging field of photography.

Remember, to get expression that reveals character and personality, you must take your subject's mind off having his picture made. It helps immeasurably if you handle your camera and lights automatically. So practice, practice with the camera unloaded, going over and over the picture-mak-

ing process until you do every step without thinking. Practice focusing, practice composing in the finder or on the ground glass, setting the aperture, working the shutter, winding the film or pulling the slide, checking, and double-checking. Do it over and over again.

Practice arranging your lights to see how the shadows fall and how much light reaches the background. Unless you have an unusually patient friend whose eyes aren't troubled by the constant shifting of lights. you can do better with a model head borrowed or bought secondhand from a millinery shop. Two floods or spots are enough, but if you have a third, use it on the hair. With no artificial lighting at all, you can utilize good window light and a cardboard reflector. Strive for contrast between background and subject, with more light on one than the other, so the tones won't merge. Then work out several fairly standard light placements that you like and memorize them.

When practice has perfected your tech-

Portraits Are Difficult?

nique, you will be ready to tackle your first subject. After you have chosen him or her, do some deliberate planning. Think about him and try to decide, if you don't know already, his dominant trait or quality or the impression you want to bring out. Plan a series of poses and expressions that will bring out this trait, with or without props. Your shots may include only head and shoulders, or they may be three-quarter or full length. They may be formal or informal. Study the physical structure of your subject's face.

Plan a series of angles and lighting schemes that will subordinate such blemishes as a large nose, a prominent chin, or an ex-

tremely thin face, and will emphasize the best points, for a pleasing likeness is one of your aims.

With your plan in mind, you are ready to start on your portrait. Set up your equipment — seat, tripod, camera, and lights — before calling your subject into the room. Save a few last-minute adjustments until after he has been seated, for these sometimes serve to help take his mind off himself. Often an explanation of the photographic procedure will relieve his self-consciousness, or you might try discussing the movies, current happenings, sports, or anything in which he is interested. Some-

times a prop, like a cigarette or a book in his hand, will make him feel less stiff and posed even if it doesn't show in the finished picture.

Meanwhile, make a quick last-minute check of details such as a stray lamp shade or corner of a framed picture that might spoil the background, a crooked tie or collar, or a disorderly lock of hair.

And now you are ready to click the shutter the instant you get the expression you want on your subject's face. Often this can be achieved with a simple trick, such as asking him to smile but not to hold the smile. Make the exposure just at the end of the smile when his face is still relaxed. Other





No one need be told that everything is right in one of these photos and everything wrong in the other. At left, stiffness, bad nose lighting, collar owry, and cluttered background. Above, the same subject in a real partials.

old stand-bys are remarks such as, "Don't look so serious. This is painless, you know—not like the dentist's." One photographer used to ask soldiers for a "furiough expression." This invariably drew an eager, "I wish I had a furlough!" The moment the lips stopped moving and before the sparkle was lost, the shutter was snapped.

One old trick that relaxes facial muscles and adds good high lights is to get the sitter, especially a woman, to moisten the lips. Click the shutter the instant the lips are still again. Try it yourself and feel how tenseness around your mouth is relaxed.

That's all except for a few rules.

They might be stated this way:

Keep lighting simple. Use only 45-deg lighting at first. There will be plenty of time later to be as daring as you wish.

Take your time. Warn your subjects at the start that picture-making is a slow process, and let nothing hurry you into a bad shot.

Have a simple background. It should be plain or at least undistracting. Seat the subject far enough in front of it to avoid



Taken with an ordinary bas camera, this characterstudy of a girl shows that it's the photographer, rather than costly equipment, that is the crucial ingredient in picture quality. One simple trick is employed to add life to the photo at left—body and head are turned at slightly different angles.

shadows. A plain wall or unpatterned blanket will do. If you have neither, a large aperture will throw the background out of focus.

Most people look best with the face in a three-quarter pose, but there are variations. A thin face looks fuller from the front; a fat one is narrowed by a slight turn. Noses can often be straightened by taking them at just the right angle. Body and face turned in slightly different directions adds life. A high camera angle helps double chins, jowls, and long necks—but not bald heads.

If you can't get his face relaxed, take your subject smiling.

Diffuse the lights with tissue paper if your camera has an extremely sharp lens. This softens facial lines without retouching. For extreme diffusion, fasten cellophane over the camera lens with a rubber band.

Take plenty of exposures. The right expression is fleeting. Tastes differ, too, and what you like may not please your subject. Give him as many pictures as possible.



TRY GRANDPA'S CAMERA

THERE'RE PICTURES IN THE OLD BOX YET

pawnshops, and the storerooms of photographic-supply firms are cameras long considered junk but still capable of taking good pictures. Such were the three old-timers shown here.

The 4" by 5" Eastman box is dated about 1885. I cut the box in half and mounted on it the plate back from an old 4" by 5" Ger-

man Mentor press reflex. Used with highspeed cut film and a No. 20 photofiash bulb
on "open" flash, its lens is amply fast for
posed shots in dark interiors. The lens has
remarkable depth and cuts sharply to the
corners. Stopping down is done with the
primitive Waterhouse disphragm, and the
shutter, an old "guillotine" type, is set by
pulling up on a catgut string.

Having a lens of rather long focus, the 3%" by 4%" Pony Premo B makes fine portraits. Its iris diaphragm, U. S. aperture markings, and listed shutter speeds from 1 to 1/100 second date it at about 1900. The 4" by 5" plate camera of the nineties with a

Used with modern, fost out film, the 1885 Eastmon box at left makes good pictures. A button pull draws up its guillotine shutter.

Excellent portraits are taken with the long-focus lens of the Pony Prema B shown below. The job at right has a double extension bellows, and a rising-falling front.



double - extension bellows and tilt back has proved valuable in copying and in picturing small objects. For good definition I mounted on it a modern Zeiss f/4.5 lens in place of its old rapid-rectilinear one.

Many old cameras have double - extension bellows and a rising front, and some also have a tilt back. Lens boards are easily removed

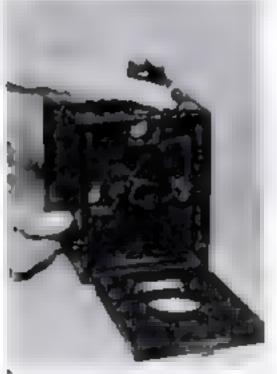
for substitution of another objective. A portrait attachment can be used on some old lenses to achieve a wider angle.

In buying an old camera, check every detail. Look for excessive sag and broken corners in the bellows and for warp in the frame, listen to the release at each shutter speed, and open and close the diaphragm. Examine each plate holder and slide for breaks and warping; then put each holder into the camera and pull it out again to determine whether the frame is sprung.

When you get home, open every holder, wipe it out thoroughly with a cloth, acrub with a dry, stiff brush, and tap it against the palm of your hand. Clean the beliews and the rest of the camera inside and out with a cloth, and rub a little light oil or dressing into the leather. Do not oil the shutter mechanism. Clean the lens carefully with lens tissue. Check the beliews for pinholes in a strong light, shielding your eyes and the camera interior with a black cloth. Holes can be patched with adhesive tape.

Most old lever releases are stiff and inclined to jar, so it is advisable to use a rubber bulb. I believe that, because of gumming and wear, shutter speeds may be slower than indicated.—CHARLES BARR

1







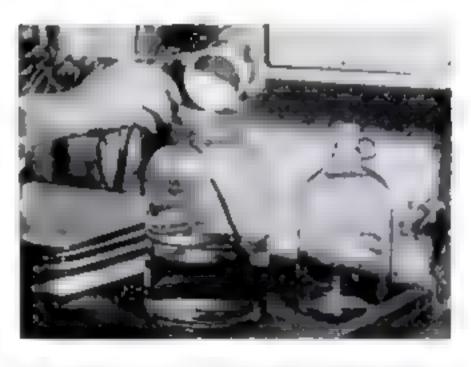
SMALL OBJECTS to be photographed can be made to stand upright by sticking them to a table with small pieces of ropelike calking compound available in hardware stores. The material will secure light objects to sloping or vertical surfaces. Molded into tiny rods or other forms, it also permits you to support pieces above a surface for taking exploded views of mechanisms. The compound sticks well and can be removed without leaving a mark.—W. E. B.



KEYHOLE VIEWS are taken by Hollywood cameramen through an actual keyhole—but it's a giant-size affair like that above. Similar comedy and decorative masks make unusual borders for home movies as well as for professional films. They can be cut quickly from large sheets of cardboard.

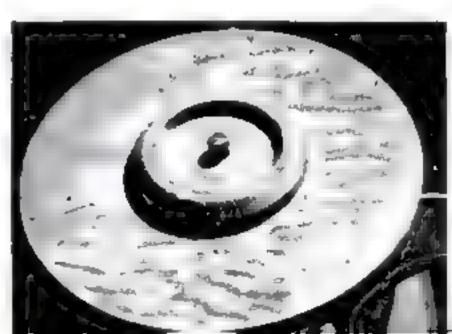
LARGE GLASS JARS for mixing photographic solutions can be premarked at the level of the final solution with a rubber band stretched around the circumference. Water poured in from a graduate serves as the initial guide. Several bands can be cemented on permanently, or lines may be marked with waterproof paint.—James P. Saunders.

PHONOGRAPH TURNTABLES are efficient agitators for developing tanks. Cut a wooden disk to cover the turntable completely and to protect it if any developing solution spill. Then turn a base to a snug turning too smoothly and will assure com-



and glue or nail it to the wooden disk as indicated in the photos below. If the bottom of the base is given a slight slope before being glued on, it will keep the tank from fit for the bottom of your developing tank plete agitation of the liquid.—SIDNEY POTT.





TAXES have nothing on this trick, right, that makes money disappear without a trace. Put a dime in the center of a bandkerchief and fold the edges over the coin. Catching the corners and the coin, lift the handkerchief aloft. For the benefit of your skaptical audience, let someone feel the coin through the handkerchief to make sure it's still there. Now, shake the hanky loose. Nothing falls out! Not surprising, either, if you've done the trick right. Using a handkerchief with a wide hem, rip out a few stitches in one corner and sew a dime into the pocket thus formed. When you lift the handkerchief, drop the loose dime in your lap. Your friends feel the concealed one.





TAKE A MATCH BOX from your pocket and open the drawer. What you see inside seems to surprise you and you can pass the surprise on to your friends by reaching into the box and pulling out a full-length pencil. How? By concealing the pencil in your left coat sleeve and cutting out the back of the box.





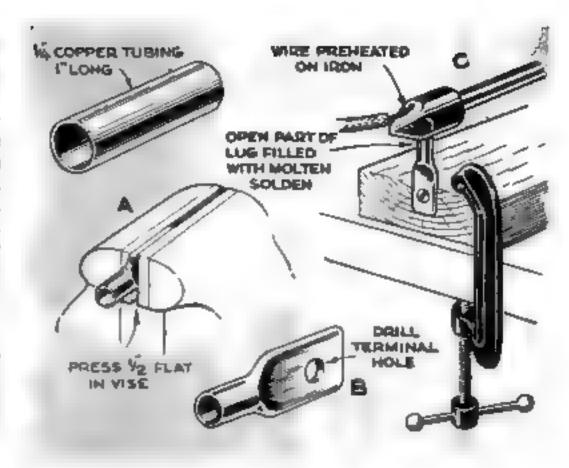
THE EYE IS QUICKER than the hand provided you know what to look for. Hold a deck of cards face down and ask a friend to draw one, look at it, and replace it without letting you see. Then shuffle and deal the cards out one by one, as below, till you come to the one he picked. You need a deck with a one-way design on the back, arranged in advance so the cards all face the same way. Turn the pack so that the right card is replaced the wrong way.

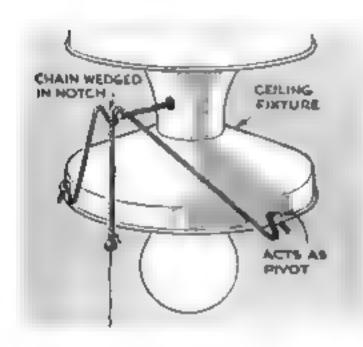


SAND DOESN'T GET WET even though it is dumped into a bowl of water and stirred thoroughly. To prove it, do just that. Then scoop the sand out slowly and it will be as dry as when you put it in. It won't work, of course, unless you have previously heated the sand together with a very small amount of paraffin wax. When cold, the treated sand will repel water effectively, and the paraffin coating won't be noticed.

Oversize Soldering Lugs Made of Copper Tubing

SOLDERING-LUG terminals capable of handling heavy currents may be speedily fashioned from odd scraps of 14" copper tubing. Saw off a piece about 1" long and flatten it for half its length in a vise. File corners round and drill the center bole: then clean the inside of the tubing with a scrap of emery cloth wrapped around a nail, For convenience in attaching the lug. screw it to a block of wood. After filling the open part of the lug with molten solder, preheat the wire and insert it quickly while the solder is still fluid.—F. R.





Pull-Chain Swivel Bracket Smoothes Operation of Ceiling Light Fixtures

LIGHTING fixtures often become sluggish in operation because the chain drags or scrapes against the frame and the return spring becomes too weak. When this happens—or to prevent it from happening—bend a length of coat-hanger wire as shown so that the spex of the curve forms a cradle for the chain. Hook the wire arms tightly over the screw heads in the lower lip of the fixture. The wire arm not only prevents the chain from snagging, but it helps it to spring back.—G. HAMLIN LEONARD.

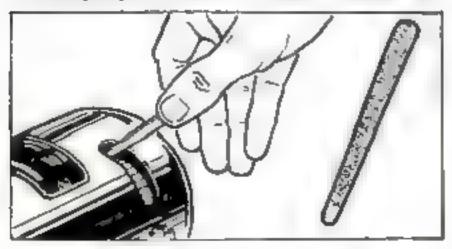
Spring Block Acts as Temporary Terminal

ELECTRICAL experimenters often have need for a terminal block to join wires temporarily while testing or hooking up circuits. Usually this is done by twisting the bared ends of the wire together, but in many ways it is more convenient and safer to use a terminal block.

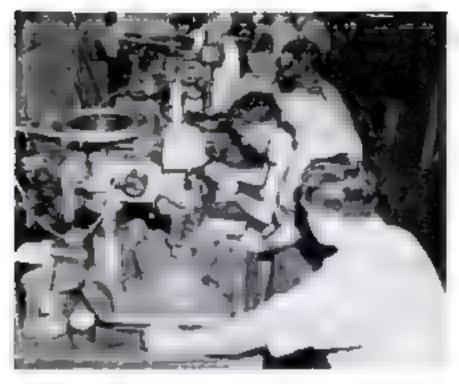
Mount a short piece of spring wire—preferably bronze or brass—to a nonconducting base by means of two small angle pieces. To make contact, press the bared ends of the wires through the turns of the spring, but be sure the current is off first.—HAROLD P. STRAND,



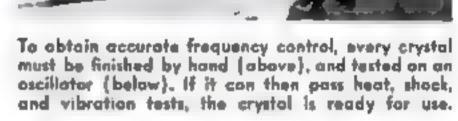
Sandpaper Nail Files Used to Clean Small Motor Commutator



ROUGH commutator surfaces sometimes cause otherwise perfect motors to spark badly and operate far below normal speed. Most often, to be sure, these symptoms can be traced to badly worn brushes, but if these are not at fault, hold a sandboard against the commutator while running the motor at lowest speed. Smoothing the rough edges should immediately improve the efficiency of the motor.—A. E. SCHIEVE.



Modified drill presses, fitted with lapping plates, are used to reduce quarts chips to approximate size.



Army Crystal-Grinding School Trains Sailors and Marines

PAPER-THIN quartz crystals, which have helped maintain military communications under the most difficult battle conditions, must be finished to within one ten-thousandth of an inch of specification—definitely not a job for amateurs. Even slight errors would affect the frequency to be selected.

The Army's only school for crystal craftsmen, a part of the Holabird Signal Depot, at Baltimore, is attended also by Navy and Marine Corps personnel. After an eightweek course, trained technicians are sent into the field to process the frequency-controlling oscillator plates used in practically all service radios.



New Canadian Station Broadcasts to World

ONE of the most powerful shortwave stations in America has been placed in operation to beam programs all over the world. The site of the station, a salt marshland at Sackville, New Brunswick, Canada, has proved doubly advantageous; the marsh acts as an "electric mirror" that augments signal strength, and the location is one of the few in Canada uninfluenced by the north magnetic pole. The station boasts a highly directional beam antenna, pictured at the right, that is said to multiply effective output many times. More than 26 miles of wire are used for the antennas, connected to towers varying in height from 170' to 380'.

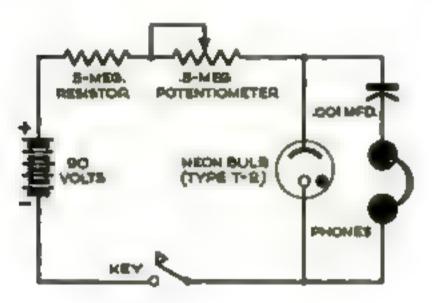


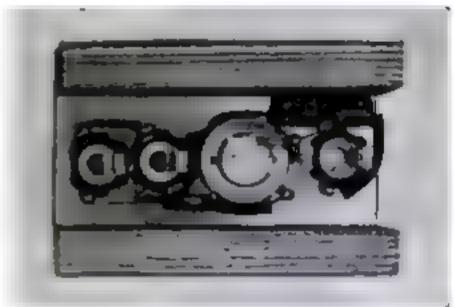
BEPTEMBER, 1945

Relaxation Oscillator Makes Portable Code Practice Set

LEARNING the dot-and-dash alphabet is only a preliminary step in code mastery, for the knack of fast operation really depends upon getting acquainted with the sound of the incoming signal. This compact practice oscillator has the advantage of being adjustable through a variety of sound frequencies and tones. The capacity of the condenser connected in series with the headphones determines the fundamental frequency of the oscillator; if a higher pitch is wanted, it may be necessary to use a smaller condenser. Some tone control can also be obtained by adjusting the potentiometer. Many types of small neon tubes will work satisfactorily in this circuit. A miniature 90-volt. B battery can be used safely as the current drain is slight.-Walter F. Powell, Jr.



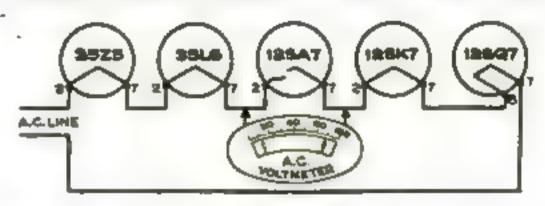




Home Test Gives Quick Check on Burned-Out Tube Filaments

BURNED-OUT tube filaments account for a great percentage of radio failures and are worth looking for when a radio goes dead. When filaments are connected in parallel, allow the set to cool, turn it on, and touch all the tubes. If you find one that stays cool, you're hot.

In an A.C.-D.C., series-wired radio, none of the tubes will light, but an A.C. voltmeter will point out the guilty one when held across each pair of heater terminals. The meter completes the circuit and



gives a reading of about 110 volts. If the filament should close during the test, the voltage will drop to its normal value for the tube.—G. BOLTON.

High-Temperature Solder Found to Shorten Life of Fine Wire

MOLTEN solders have been found to reduce the diameter of copper wire and cause some embrittlement of the parts subjected to high temperatures. In tests conducted by engineers of the Fairchild Camers & Instru-

ment Corp., of New York, it was shown that destructiveness was greatest in fine wires and increased with the tin content of the solder. For delicate work, therefore, solders of low melting point should be used.

Trouble-Shooting A. C. Motors

By JONAS H. WOOD

OTORS of less than 1 hp. are playing an increasingly important part in the home and workshop, and yet they get little or no attention until they begin to smoke or refuse to start. The average person feels

A little preventive maintenance will keep many a small motor going. The chart below will be of help in trauble-shooting.

MOTOR	TROUBLE	PROBABLE CAUSE	WHAT TO DO
Split-phase and aplit- phase con- denser or capacitor	Will not start	Open circuit in line	Check current to motor leads
		Thermal overload out	firmer severgeast rates
	Nume, but will not run	Starting awatch points not closed	Clean starting switch
		Open circuit in running or starting winding	Check continuity with test light
		Defective condenser	Replace condenser
	Runs alowly and jerkily and heats rapidly	Starting-awitch points not opening at proper time	Clean polyta, check centrifugat throw-out springs
		Bearings gummed	Clean with carbon tetra chioride: use fresh oi)
		Broken or loose bars in rotor	Replace or tightm bars
Series (D C and universal types)	Will got start	Open circuit in line	Check current to motor jeads
		Brushes not making contact with commu- tator	Check brush springs and replace worn brushes
		Open circuit in field	Check for continuity with test light
	Runs slowly and overheals rapidly with excessive apparaing at brushes	Dirty or scored commutator	Clean with carbon terra chloride and fine sand paper if badly grooved turn down in lathe
		Shorted commutator bars or high muca	Clean between bars and undercut mica
		Shorted windings on armstore	200000 200000
Repulsion- induction	Will not start	Open circuit in line	Check current to motor
		Brush yoke may be loose and shifted to neutral point	Move yoke to right or left and tighten actions
	Hums, but will not run	Brushes not making confact with commu- tator	Check spring tension on brush holders replace
	Runs, but will not come up to speed, over- heats rapidly	Shorting device not in contact	Check centrifugal
		Shorting necklace	Replace neckiace

that he has done his part when he fills the cups with oil once in a while; and then, when a motor burns out, he gets a new one and promptly treats it in the same offhand way.

This may have been all right in the days when homes had few appliances; but now, with motors for oil burners, stokers, re-

frigerators, washing machines, vacuum cleaners, sewing machines, food mixers, electric fans, movie projectors, and basement-workshop tools, systematic care pays off in protecting one's investment.

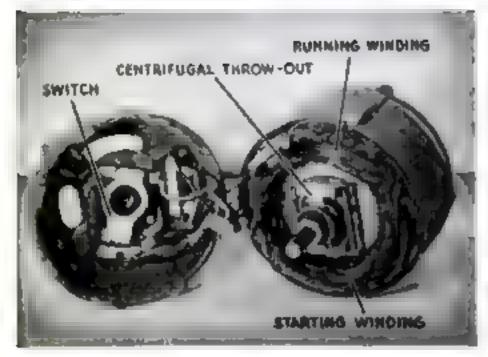
Proper oiling and cleaning are the best preventive maintenance. Never use too much oil and never oil too often. The manufacturer's advice, as set forth on the name plate or in an instruction booklet, should be followed. Motors having aleeve bearings and a packed wick need oiling only every 1,000 hours of use. Old-type motors having a removable reservoir at each end with a spring and wick bearing on the shaft should have their reservoirs kept filled with a good heavy oil. Ball bearings need occasional cleaning and repacking with new grease,

A clean motor is the best insurance against burning out. Look fairly often at the windings and switch, for 90 percent of all trouble starts with dirt and oil in one or the other. Use only carbon tetrachioride for cleaning, and don't use too much of that. When you have trouble in spite of precautions, the chart at the left will help.

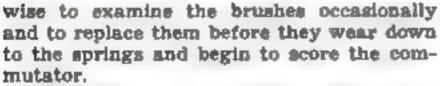
All appliance and homeworkshop motors fall roughly into five main classes. Four are variants of the single-phase A.C. induction motor. The fifth is the universal motor designed for use on either A.C. or D.C. It is found in sewing machines, vacuum cleaners, food mixers, home-movie projectors, portable drills, saws, routers, and business machines.

Universal motors have a wound armsture, two fixed brushes, and a higher speed than induction motors. It is





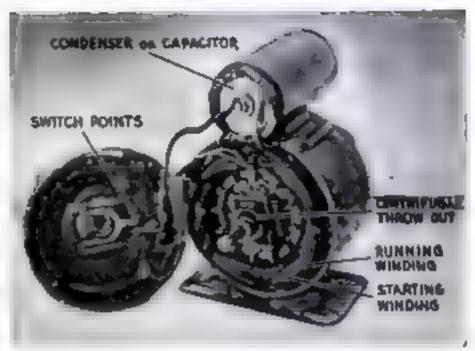




Single-phase A.C. induction motors exert no turning force with a single winding and must use a secondary stator winding or wound armature to obtain the revolving magnetic field necessary for a start. As speed reaches 70 or 80 percent of normal, this auxiliary or false second phase is cut out, and the motor then operates on single phase.

Most of the motors in common use are of the single-phase induction type known as split-phase motors. They are equipped with an auxiliary winding that is displaced in magnetic position from the main winding and connected in parallel with it. These motors are found on machines with light starting loads, such as washing machines, churns, bottle washers, some business machines, oil burners, blowers, centrifugal pumps, phonographs, woodworking tools, grinders, and other machine tools.

Split-phase motors can be recognized by their solid rotor, two separate stator windings, and a centrifugally operated switch for cutting out the starting winding at proper speed. This switch is a focal point for trouble since all the dust, lint, and shavings drawn in by the internal fan collect at this point

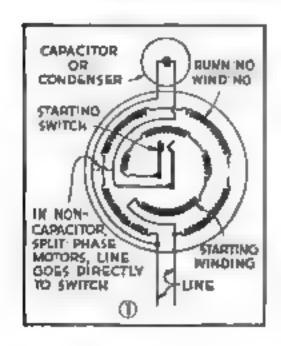


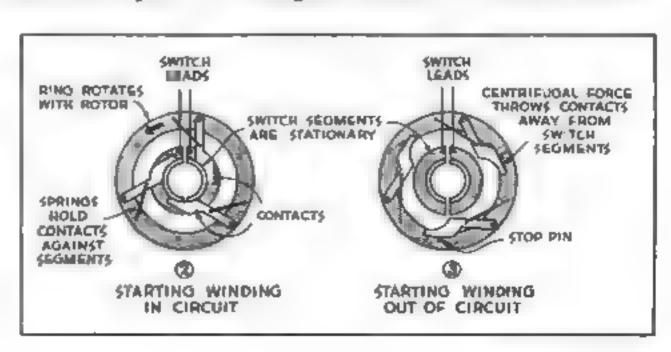
Split-phase capacitor motor.

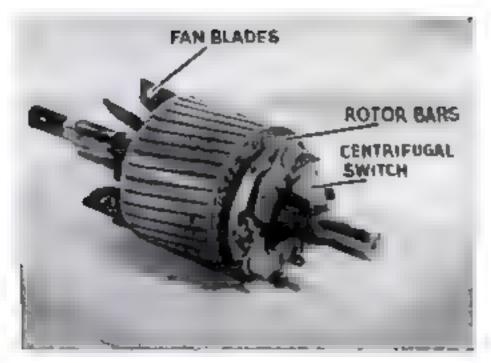
on any excess oil that might be thrown by the shaft. As the switch opens, the arc sometimes sets the debris on fire and burns out the motor.

The capacitor or condenser motor has a round or square can, usually mounted on the top or side of the motor frame and containing the condenser or capacitor component. Some have a doughnut-shaped condenser inside the motor case. They have two windings and centrifugal cutout switches. Their use is on appliances like refrigerators, pumps, and stokers with fairly heavy starting loads. It is good practice to remove the end bells occasionally and blow out dirt and grease from the switch and windings.

Repulsion-induction motors are used for the heaviest starting loads, such as water pumps, air compressors, and some of the older refrigerators. They are characterized by a wound armature similar to a D.C. motor and two or four brushes mounted on a movable brush yoke. All have a device for shortcircuiting the commutator bars as the motor comes up to speed. Governor weights on the front end of the armature in one type push through the core to bring the shorting necklace in contact with the rotor bars and to lift the brushes from the commutator face. In the brush-riding variant, the shorting device is pressed against the bars by centrifugal force while the brushes remain







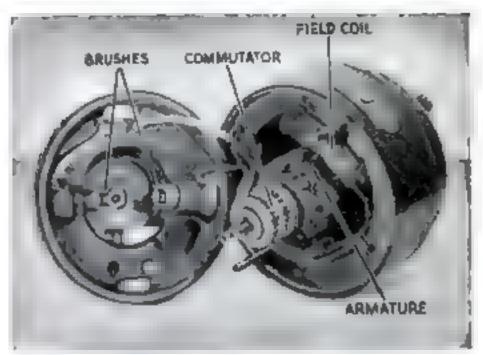
Rator from a split-phase motor.

in contact. Trouble can usually be traced to dirt, oil, or a broken necklace in this starting mechanism.

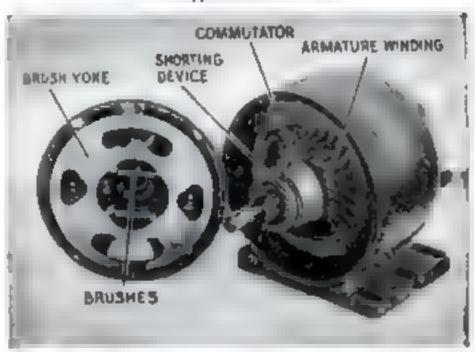
Shaded-pole motors are the type usually found on fans and small appliances having a light starting torque. This fourth variant of the single-phase A.C. induction motor is a small motor with copper rings set in slots in the stator to assist in starting. There is no commutator, switch, or alip ring, and the shaft is the only moving part. Such motors are rugged and reliable, but on a heavy load, or if the bearings are gummed, they will stall quickly and may burn out if the current isn't cut. Because little can go wrong, they are omitted from the check list. Nothing is required in the way of maintenance except cleaning and oiling.

On heavy duty or where a motor may be loaded beyond its rating, try your hand frequently on the housing to test for overheating. A rise of 50 deg. C. is usually safe during operation. Name-plate information generally gives permissible temperature rise.

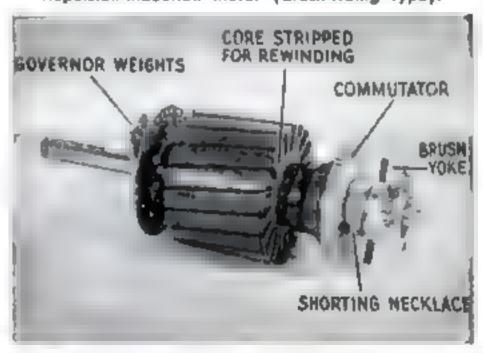
Once in a while, depending on how much the motor is run, check on the brushes, holders, and shunts, and clean the motor with compressed air. Grease should be cleaned out of ball and roller bearings and replaced every year or two.



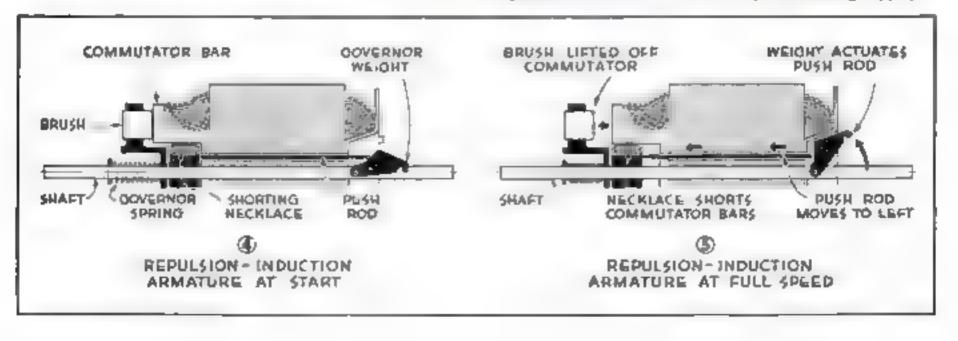
Series-type blower motor.



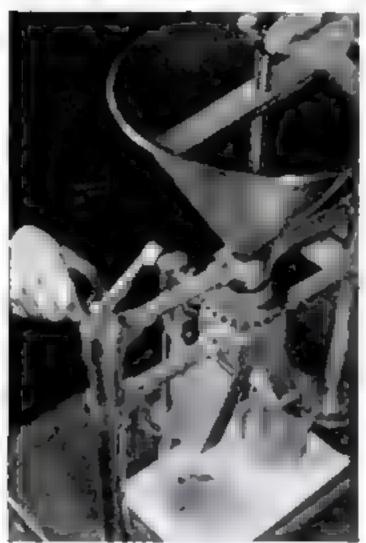
Repulsion-induction motor (brush-riding type).



Repulsion-induction armoture (brush-lifting type).



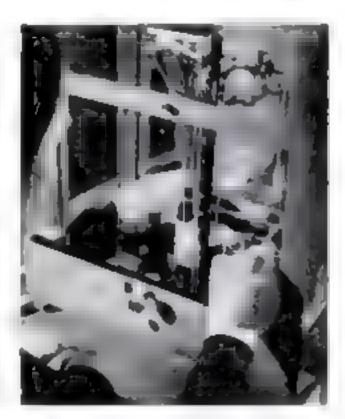
HOW DO YOU KNOW THEY'LL SPROUT?



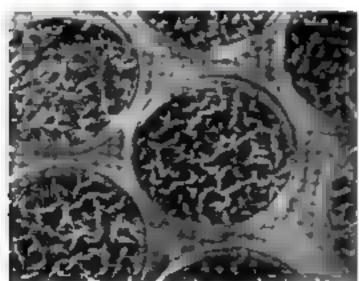
WHEN your flower seeds produce a ragged yield, you have plenty of reason to be sore. But that's poor consolation for a farmer or Victory gardener who has lost a season's crop. Germination tests take the guesswork out of planting.

Preparing for a test at the seed laboratory of New Hompshire University. The sample is first thoroughty mixed in the machine, left, that resembles an oldstyle coffee grinder.

In order to forecast the size of the crop that may be expected from a given batch of seed, it is necessary to know the exact size of the specimens being tested. At the right, samples are weighed.









With the aid of a magnifying lens and a pair of tweezers, pure seed is separated from inert matter, other plants, and weeds. The resulting percentage is a guide to quality.

Germination tests are made by placing seeds on domp blotting paper, as shown at the left, center.

Germinated seed, left, ready to be counted. The mold-like fuzz is the root system. Time and temperature of all tests must be rigidly controlled. Percentage of germination is determined by hand-counting the sprouts, as at right.



194

Tracing-Paper Window Shade Takes Glare Out of Sunlight

IF YOU are bothered by glare from a window adjacent to your drawing board or other work table or bench, you can find the remedy in a large sheet of draftsman's tracing paper. Remove the original shade from its spring roller, and substitute for it a sheet of tracing paper as wide as the window and a few inches longer. Ordinary shades darken a room when drawn, but the tracing paper will admit an evenly diffused, soft light that is easy to work by.

The tracing paper may be attached to the roller with cement or adhesive tape, or the end may be folded down 1/4" and cemented and tacked. For a stiff bottom edge, fold up 1/4" or 2" and cement it around a thin wood strip. Insert a screw eye and attach a pull cord. If properly attached the tracing paper can be rolled up and down like a shade, but a little extra care is required to avoid creasing or tearing the sheet.—H. DROUYN.



Clamp Pressure Realigns Bristles of Reclaimed Paintbrush



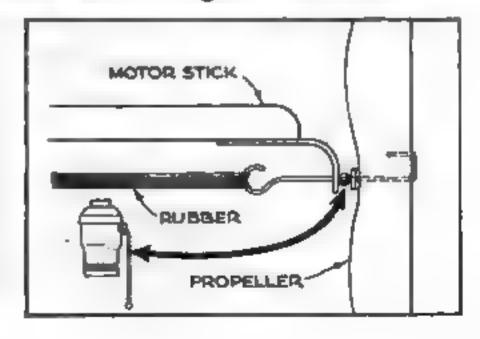
ONE great fault with reconditioned paintbrushes is the bushiness of the bristles caused by dried paint at the roots. No matter how hard you work, some dried paint stays.

This can be corrected with a %" wrapping of heavy twine starting at the ferrule. Wrap the twine tightly, tie it firmly, and then squeeze the base of the bristles in a clamp. Let the brush dry thoroughly and shape it carefully. Pressure flattens the bristles to almost normal thickness, and the twine prevents bulging edges.—E. M. L.

Bearing for Model Plane from Electric-Light Pull Chain

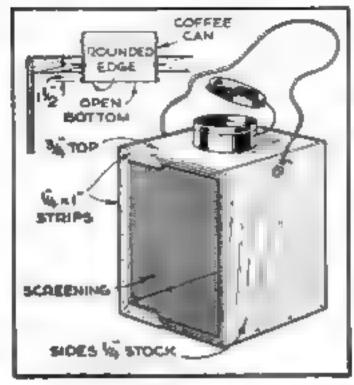
A SINGLE brass ball clipped from an electric-light pull chain will substitute for a glass bead as a propeller bearing on a model plane. It already has the necessary center hole and will create little friction between the washer and the steel motor mount.

In cutting off the ball, take care not to let the small nub of protruding wire slip back into the cut. Grasp the wire with the pliers and pull it out; then smooth the ball with emery cloth. If you have trouble keeping the wire nub from getting lost inside the ball, cut off two balls together and pull them spart.—ALPRED G. MILLS.



Safe-Top Cricket Box for Boy Fishermen

ANY small wooden packing box can be used for this bait carrier, or a box may be built of light stock. Tack screening on one side and cover the edge with thin strips. A hole is cut in the top to fit a tin coffee can. Funch holes in the side of the can to nail it on. Even when the lid is off, the projecting lower edge of the can will keep crickets from jumping out. — FREDDY MITCHELL.







Runway from Porch Gives Pets Access to Pen

CATS and other small pets can go outside for sunning whenever they wish, and yet be kept from annoying neighbors, with a runway leading to a pen from a rear porch. Provide an opening for the runway in the porch screen or lattice and another in the pen, and enclose both runway and pen with screening. Hinge the top of the pen so the inside can be cleaned.—H. LEEPER.

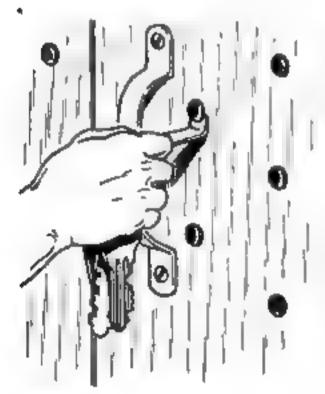
Camouflaged Barrel Bolt Locks Garage Door Against Prowlers

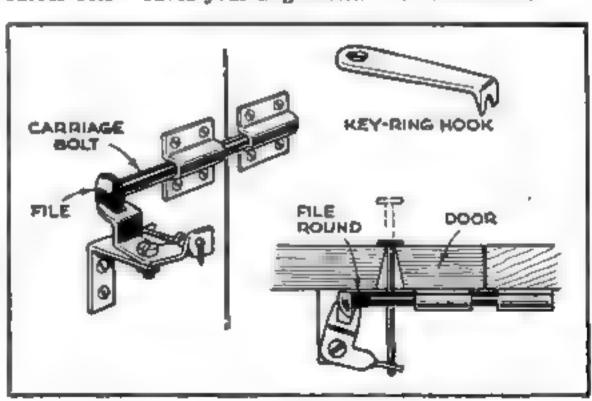
If the hardware shortage has left your tool-shed or garage door swinging in every breeze, bend a few metal brackets to the shapes shown below and shut the door on the vexing problem. The bolt is actuated by a nail with a head that looks exactly like the surrounding ones in the outside boards.

A carriage bolt used for the barrel bolt

passes through U-shaped brackets to lock the door. Bend the end of the nail, as indicated, and hook it to a pivoted piece of strap iron bent to form a bell crank. The bolt slides as the nail is pulled or pushed.

You can unbolt the door without a key, but a small nail puller on your key ring saves your fingernails.—P. B. HORSLEY.





HOME EXPERIMENTS SHOW SOME PROPERTIES OF LIGHT

canole power means the luminous intensity of any light compared with that of a standard candle. A Joly photometer, an instrument for helping determine this comparative brightness, can be made by warming one face of each of two identical blocks of paraffin and pressing them together, like a sandwich, with a piece of tin foil of equal size between.

Place the composite block at right angles to a yardstick and darken the room. To illustrate the principle of the photometer, set a candle at any chosen distance, say 6", from one block. Move a similar candle back and forth along the yardstick on the opposite side of the block until the illumination of adjoining edges of the composite block is the same. If the candles are identical, the

second should come to rest the same distance from the block as the first.

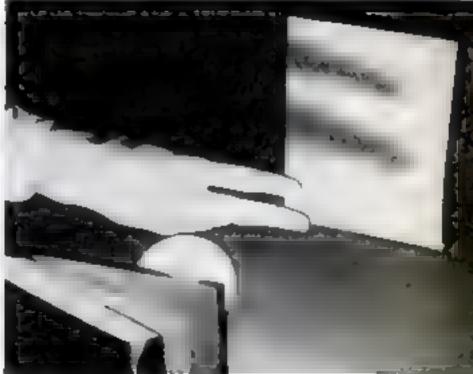
By the same procedure, if you know the candle power of one light, you can determine that of a second. First, find the distance from the block at which the unknown

FROSTED BULBS are superior to clear ones for general lighting because they reduce the shadows cast by small objects. Hold two fingers between a clear bulb and a sheet of paper, and sharp shadows result. With a frosted bulb, the shadows are smaller, grayer, and fuzzy. Why? Because the entire surface of a frosted bulb acts as the light

produces illumination equal to that of the known. Then divide the square of this distance by the square of the first distance and multiply by the candle power of the known light. The result is the unknown candle power.

source. When the light source is smaller than the obstruction, as in the case of the filament of the clear bulb, the rays are blocked, producing a dense shadow that increases in size as the surface on which it falls is moved away. The reverse is true with a frosted bulb since the light (the entire bulb) is larger than the obstruction.





FOCAL LENGTH. Cut a triangular hole in the center of a cardboard shield placed over a lamp reflector. Now move the reflector and a white screen back and forth simultaneously on opposite sides of a convex lens, keeping both equidistant from the lens, until a sharp image the size of the triangular hole is formed. Measure the distance from the center of the lens to either the light or screen, divide by two, and you have the focal length of the lens.





COLOR FRINGES mark the images formed by a simple lens. Known as chromatic aberration, this effect results because glass bends each color ray a different amount, giving each a different focus. To show this, place a light a little closer to a lens than twice the focal length (as determined above). In a cardboard lamp mask, cross two threads over a round hole. Cover the hole with red glass and focus the image by moving the screen. Now substitute dark blue glass. You'll find that the blue image will not be sharp at the same lens-to-screen distance.



CONCAVE MIRRORS produce real images and have definite focal lengths like lenges. You can demonstrate this with the setup shown at the left. In this case, the lamp mask used in the preceding experiment also serves as the screen. Mount the mirror so that its center is directly in front of the light and move the mirror back and forth until the image is sharpened and brought down just to the size of the hole. Then the focal length of the mirror is exactly one half the distance between the mirror and the screen.

REO INK made from certain antine dyes is sometimes green. Put a few drops on the bottom of an inverted tumbler, look directly through it, and the ink is red. But hold the tumbler so that light is reflected from the surface, and the ink appears green. Likewise, a very thin sheet of gold leaf held between your eye and a strong light is not yellow but green. The mechanism of this strange effect is not definitely known, but it results from some sort of selective reflection at the surface.



MEET H2 O2 . . . FIRST COUSIN TO WATER

Hydrogen Peroxide

By KENNETH M. SWEZEY

or so long ago a cut or bruise always meant a scamper to the household medicine cabinet for the bottle of peroxide. Dabbed or poured on the wound, this watery stuff smarted and fizzed furiously—actions which suggested that every single microbe could do no less than turn up its heels and die.

Scientific research soon proved, however, that the germ-killing power of hydrogen peroxide was greatly exaggerated; that the fizzing was caused by oxygen bubbles released by the catalytic effect of blood, dirt, tissue, and pus; and that in deep cuts such rapid evolution of gas might even cause further injury by tearing the inner tissue.

Because gentlemen (some of them, at least) prefer blondes, women long ago began turning to this interesting chemical as

a hair wash. Glamorous "peroxide blondes" are the result. Because it is a strong oxidizing agent, hydrogen peroxide changes the organic pigments of the hair into colorless compounds. The "golden hair washes" now



Drop sulphoric acid into an ice-cold borium peroxide solution until it has been neutralized. This reaction produces hydrogen peroxide.

on the market are chiefly hydrogen peroxide with a trace of nitric acid added.

During the war, 95 percent of all the hydrogen peroxide produced has been devoted to essential civilian industry and secret military uses. The fact that it is distributed in tank-car lots indicates its importance.

Hydrogen peroxide always has been widely used as a textile bleach for it causes little harm to the cloth and the only residue left is plain water. Plants busy turning out cloth for military uniforms require large quantities for this purpose. Cotton cloth, a drab gray when it slides from the looms, is turned a permanent snow white before being made into underwear, shirts, and socks. Raw wool is bleached before being dyed.

Besides textiles, this liquid bleaches many other substances—raw sugar, tripe, fish, figs, furniture woods, casein for light-colored plastic articles, and cow and goat hair used in household items. It helps control the ever-present bacteria in gelatins used for foodstuffs, photographic films, and glue. It

Barium sulphate, which remains after reaction has produced hydrogen peroxide, must be filtered out, as at for left. Ether and an acidified potassium chromate solution in the tube just at left test for H₂O₃, Even a trace turns the other dark blue.











Stand test tubes containing hydrogen peroxide and various catalysts, such as powdered charcool or chalk, in a beaker of hot water. Oxygen bubbles stream out. Center, a drop of concentrated H₁O₁ explodes when it falls on manganese dioxide. Right, it is used as a bleach to remove discolaration caused by scorch.

purifies various metal salts employed in paint making and electroplating.

Hydrogen peroxide, H₂O₃, is produced commercially by reacting barium peroxide with dilute sulphuric acid—a process that can be carried out on a small scale in a home laboratory. The reaction must take place at a low temperature to prevent decomposition of the chemical. Put about 100 grams of chipped ice into a beaker, stir in 50 ml. of water, and dissolve in the mixture about 10 grams of barium peroxide and 2 drops of phenolphthalein solution (to serve as an indicator). Dilute 1 part of sulphuric acid with 8 of water, making certain that you add acid to water and not vice versa. Stir this, drop by drop, into the peroxide solution until the pink color disappears.

When your solution thus has been neutralized, it must be filtered immediately to remove the barium sulphate, for this fine precipitate, acting as a catalyst, promotes decomposition of the hydrogen peroxide,

A simple test, so delicate that it detects 1 part of hydrogen peroxide in 100,000 parts of water, will easily prove that you have really compounded H₂O₂. To a test tube half filled with water add just enough potassium chromate or bichromate to produce a light-yellow color. Also add 5 ml of sulphuric acid, deluted 1 part of acid to 3 of water. Pour ½" of ether on top of this and put in several drops of your peroxide solution. Stopper the tube and shake the contents. When the ether again has separated, you will find it colored the deep blue of perchromic acid, a sure sign H₂O₂ was present.

Pure hydrogen peroxide can be made, but it is extremely unstable and may decompose with explosive violence. Commercially, fairly stable solutions of 30 percent concentration are obtainable. The drugstore variety usually is a 3 percent, or 10 volume, solution of the chemical in water. Ten volumes means 1 of solution will give off 10 of oxygen.

Light, alkalis, manganese dioxide, and many fine substances all promote the rapid breaking up of H_iO_i into water and oxygen. To demonstrate how readily it parts with its extra atom of oxygen, put a little powdered charcoal in one test tube, some powdered chalk in another, and a little sodium hydroxide in a third. Fill each of the tubes to the halfway mark with hydrogen peroxide and stand them all in a beaker of hot water. Oxygen bubbles soon begin to stream to the top in each of the tubes. But if you now add a little acid to another tube containing hydrogen peroxide and stand this in the hot water, you will notice that few, if any, bubbles are released from the fourth tube. This is because acids and certain organic substances, such as acetanilide, act as negative catalysts, inhibiting decomposition.

In contact with powdered manganese dioxide, hydrogen peroxide of 30 percent concentration breaks up with actual explosive violence. You can demonstrate this by placing a little of the powder in an evaporating dish and allowing a few drops of the concentrated chemical to fall upon it from a height of 6" or more. As each drop touches the catalyst, the liquid decomposes with a small explosion, releasing the oxygen





Hydrogen peroxide brushed over lead acetate darkened by hydrogen sulphide restores the original white color, left, as it will when applied to white lead point. It also functions as a reducing agent. If a few draps are added to a solution of potassium permanganate and sulphuric acid, right, molecular oxygen evolves.

and vaporising most of the water in a cloud of steam. Remember that it is dangerous to decompose more than a few milliliters of such powerful hydrogen peroxide at a time. Further caution must be exercised in handling, for H_1O_1 of this concentration will injure the skin almost as badly as acid.

In the laboratory, drugstore hydrogen peroxide is an excellent source of small quantities of oxygen. A generator is easily made. Put a little powdered manganese dioxide or a warm solution of sodium hydroxide in the bottom of a small flask equipped with a two-hole stopper. Place the stem of a separatory funnel through one hole and a delivery tube through the other. Regulate the stopcock on the funnel so that hydrogen peroxide is admitted drop by drop. Oxygen will issue from the delivery tube.

Under the proper conditions, hydrogen peroxide changes black into white. You can demonstrate this by soaking a sheet of paper in a solution of lead acetate and then holding the sheet in the furnes of hydrogen sulphide—generated by pouring a little dilute sulphuric acid on a few grains of iron sulphide in a test tube. Let the paper dry after it has become completely black. Then paint over the black surface with a brush dipped in peroxide. The black turns white.

This experiment shows why hydrogen peroxide will restore the brightness of white lead paint. Such paint often turns dark because hydrogen sulphide in the air reacts with it, producing black lead sulphide. When hydrogen peroxide is applied, the dark lead sulphide changes into white lead

sulphate. This same principle often is used to brighten old oil paintings.

Around the home, hydrogen peroxide is useful for bleaching out many fruit stains and the color from organic dyes. Scorch marks may also be removed from cloth if they are not too bad. When the spotted or marked article is small, place it bodily into warm 3 percent hydrogen peroxide. Move the article about and inspect it occasionally to note the progress. In the case of larger articles of clothing, dip the spot alone into the solution or saturate a cloth and rub it.

Strange as it may seem, hydrogen peroxide not only is a strong oxidizing agent, but it sometimes is just the opposite—a reducing agent, or a substance that robs oxygen from a compound. For example, it does that with potassium permanganate.

Dissolve a grain or two of this chemical in a test tube half filled with water and add a few drops of sulphuric acid. If you now add hydrogen peroxide, drop by drop, to this solution, the deep purple color will gradually disappear. The reaction is accompanied by the vigorous evolution of molecular oxygen (O₂), two oxygen atoms joined together. Although the reaction is complex, it has been proved that half of the liberated oxygen comes from the permanganate and half from the peroxide. According to one theory, the nascent or newborn oxygen liberated by the decomposition of the peroxide is so active chemically that it takes oxygen away from the permanganate in order to combine with it and form the molecular oxygen.



By KENILWORTH H. MATHUS

OU can save yourself inconvenient trips I in the early spring, and yet have everything in readiness for the opening of your summer cottage or camp next year, if you go about its closing systematically this fall.

Remove from the water all buoys, mark-

Cottage-Closing Checks V

- PAINT: Floors, porches, lawn furniture, dacks, rafts, and small boots.
- STORE: Portable walks, buoys, docks, rafts, and small boats.
- CLEAN: Garbage can, food containers, lamp shades, and bric-c-brac.
- COVER: Glassware, china, silverware, cooking utensils, drapes, pillows, mattresses, vent pipes, chimney, radio, and phonograph.
- EMPTY: Ink bottles, bread and cake boxes, and
- OPEN: Oven, refrigerator, closets, and cupboards,
- SHUT: Stove dampers and flues, blinds, and outside doors,
- DISCONNECT: Electricity, gas, telephone, water, and pump.

ers, rafts, and temporary wooden docks. Paint them so they will be ready for instant use next summer. Docks built in numbered sections are easy to handle.

Take up and store safely away from ice, snow, and tides all portable wooden boardwalks. Paint small boats and store them upside down off the ground under the cottage or in the garage. This keeps them dry and prevents nesting of rodents in them. Remove from the garage or sheds articles that might be damaged by an unusually high tide, heavy snow, or freshets.

Soak in kerosene and brush with grease all carpentry and garden tools to prevent rusting. Repaint and store lawn furniture, and store flagpole and awning lines.

Wash silverware, glassware, crockery, and cooking utensils. Arrange them in small piles, put each pile in a paper bag, close the bags tightly, and restore the articles to their proper shelves. They will be fresh and clean when you want them again. Wash lamp shades and bric-a-brac and wrap them in newspapers to protect them against fading, tarnishing, and dust. Remove draperies, wash and iron them, and store them or cover them with cloth or pillowcases.

If you have any windows that stick, wax or soap the edges. Then batten down or board up windows or close their blinds,

paying particular attention those on the weather or seaward side. Blinds or hinged battens should not have exposed hinges that can be removed by an intruder armed with a screwdriver. Windows that have no battens and

Antifreeze or kerosene in water traps will prevent damage from winter freezes.



Your Summer Cottage

can't be boarded up should be soaped on the inside so passers-by can't see in and be tempted.

Cover cracks around thresholds with old rugs or put molding or temporary weatherstripping on the outside. This is important on the weather or seaward side.

Stop up dampers and chimney flues to keep out rodents, and tie cloth over top openings of vent pipes and chimneys to shut out birds, squirrels, and field mice. Matches, if left at all, should be in a tightly closed tin box for protection against mice.

To protect your pillows against mice and to keep them from becoming musty, they

should be suspended at their corners from a line strung across a room. If mouse trouble is especially acute, even heavy mattresses can be suspended from ropes if boards are used to distribute the load and to protect the mattresses from the ropes. Old sheets will serve as covers to keep off the

Carpentry and garden tools cleaned with kerosene and greased will resist rust.



Empty or throw away botties of ink and kitchen liquids. Freezing could make them overflow or crack their containers.

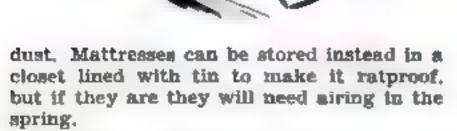
If you intend to put the cottage up for rent next year, post in a con-

spicuous place an instruction card on operation of the water pump, stove, and other equipment. This should also list the name, address, and phone number of the milkman, iceman, garbage man, a plumber and electrician, and a doctor and dentist.

Shut off the water, gas, and electricity, and have the phone disconnected. Put anti-freeze in toilet traps and the like, or have it done by a plumber. Dispose of inflammable liquids and of gas in pressure tanks.

Paint or shellac inside floors, porch floors, and steps. Then you won't have to go through the drying period in the spring.

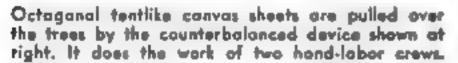
Leave a key to the cottage with a near-by winter resident or a State police barracks, and arrange with the neighbor or police sergeant to notify you in case of an emergency. Obtain permission to post a sign warning intruders: "This Property Protected by State Police." Post another with your name, address, and telephone number. Then enjoy your winter free from worry.



Leave oven, refrigerator, closet, and cupboard doors open to prevent rusting and aid ventilation. The bread box, cake box, and sugar tin should be washed and also left open. Dispose of perishable food, and clean out the garbage can. Store leftover condiments and spices in airtight tins.



Citrus trees are fumigated under tents like these to control scale insects with measured dasages of hydrocyanic acid gas. The tents confine the fumes.





Mechanical Tent Puller Aids in Fumigation of Citrus Trees

Where labor is short in citrus groves, a homemade tent puller like the one shown at right above can aid materially by doing the bardest part of the job of tree fumigation. In use in California, such machines made from scrap have pulled fumigation tents over as many as 50,000 trees per puller a season. A single puller can cover up to 80 trees with tents in an hour.

A number of different types of machines have been devised by growers. Those in use are operated on a tractor or truck chassis and, as a rule, have two long telescoping arms that lift up, pull over, and lower two corners of the octagonal canvas sheets that serve as tents. Some have a hydraulic mechanism, but the majority have a concrete-block counterbalance pivoting on a horizontal shaft. Truck engines operate the devices by means of power take-offs.

A patent on one mechanical tent puller is held by the American Cyanamid and Chemical Corporation, of New York, which invented the device when labor shortages first struck the citrus groves. It has been released by the company for free public use.

Caster Elevates Sickle Bar on Mower to Leave Stubble High



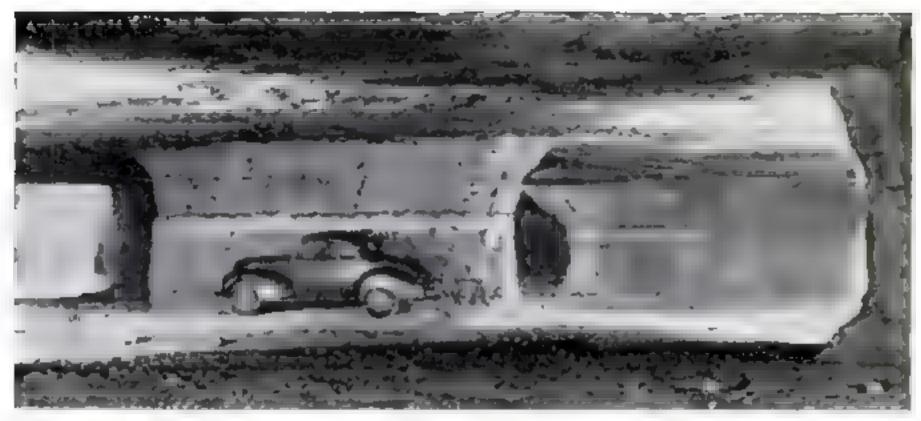
TECHNICIANS of the Soil Conservation Service at Elkhart, Kan., developed this adjustable mower caster for leaving a high stubble to combat wind erosion.

The caster shaft, about 4" long with a 60-deg, bend 1" from the lower end, fits into a 6" cast sleeve welded to the inside of the outer shoe of the bar. A take-up collar is installed through the top of the sleeve. The thrust collar at the bottom carries a felt washer. Notches in the coupling to the wheel permit height adjustment. A small trailer or wheelbarrow wheel is used,—ARTHUR W. EMERSON.

Tin-Can Fruit Picker Reaches High Branches

A NOTCH in the tin can used for this picker cuts the stem of the fruit when the pole is pushed up, and the fruit falls into the cup without being bruised. The cup is emptied into a basket when it becomes filled.—NORMAN ELISBERG.





Uncle Sam's 15-Acre Ice Box

ELPED some by nature, some by limestone miners, and some by modern refrigeration, the United States has the world's largest cold-storage plant. It is a 15-acre underground unit naturally insulated by 100' of earth and stone near Atchison. Kan., not far from the geographical center of the country. Rented by the War Food Administration from the mine company that dug it, it is intended primarily for the storage of such lend-lease and rehabilitation commodities as dried fruits and eggs. cheese, lard, and cured and sait meats.

Nature gives the huge excavation a constant temperature of 55 deg. Three compressors, each having a capacity of 250 tons of refrigeration a day, bring the temperature down to 31 deg. Double doors, like the storm doors on homes but further apart, keep cold air in and hot air out. They are opened and closed by an electric eye.

Storage capacity is from 30,000 to 50,000 tons depending on the density of the food. This void is filled from processing plants throughout the Midwest. Delivered by rail, food is put on 4' by 4' wheeled platforms for transportation to the mine.

> This door to the huge Kansas cave is controlled by an electric eye. "Storm doors" keep the cold in. Below, freight cars unload food for storage.



Gasoline mules draw huge quantities of foods to

the door of this underground cold-storage plant,







steep for land tanks. A high bumper bar, compared to that of a tank, gives the amphibians enough leverage to push over trees up to eight inches in diameter—a useful trick to clear ground for artillery aiming stakes. Armored amphibians make mobile fieldpieces. And although theoretically no match for tanks in combat, even amphibious tractors are unofficially reported to have destroyed Jap tanks.

The 21-foot, eight-ton Alligator was the first Amtrac to see combat action, taking part in the initial assault upon Guadalcanal on August 7, 1942. When the Japa got their first glimpse of these awe-inspiring machines crawling in from the sea, their dismay may well be imagined. According to a Marine officer who led one of the first waves of amphibians, the Nipponese departed precipitately and the Amtracs landed without appreciable opposition.

No one could expect a perfect amphibian on the first try, but the Alligators proved themselves so well in subsequent actions that many are still in use. Meanwhile, improved models had answered obvious demands for more size and power.

These were the LVT (2), the Water Buffalo, 26 feet long and of 14 tons, which first hit the Japs at Bougainville on November 1, 1943, and the first U. S. armored amphibian, the LVT (A) (1), which first saw action at Kwajalein, on February 1, 1944. Designed solely for fighting, this six-man vehicle bore the closest resemblance to a seagoing tank. The 18-tonner, armed with a 37-mm, gun, carried machine guns as well. Heavier armor protected the crew.

Combat experience, not theorizing, dictates changes in models. For example, men of the Alligators and Water Buffaloes had to disembark by leaping over the sides of the machine, and unload cargo the same unhandy way, while exposed to enemy fire. Thenceforth, Amtracs were fitted with built-in stern ramps. Impervious to the sea, the rubber-sealed platforms were readily lowered when the craft got ashore, making an easy task of unloading cargo and enabling troops to deploy under cover of the vehicle.

First of these ramp-type amphibians to introduce itself to the Japs was the LVT (4), an enlarged and improved Water Buffalo, 26 feet long, a ton or two heavier than its predecessor, and carrying an infantry platoon of 32 to 45 men, or a land-type jeep, or a sizable fieldpiece, complete with crew. It was the second unpleasant surprise of the day, June 14, 1944, for the Nipponese defenders of Saipan in the Marianas. The

first had been an advance assault by our latest armored amphibian, the LVT (A) (4)—a 20-ton fighting machine with a crew of five and a 75-mm, howitzer for its principal armament. Its shells, each measuring a shade under three inches in caliber, can be aimed to sail over ridges surrounding a beachhead and plop down among Japanese concentrations detected by aerial reconnaissance

Military machines don't always appear in the same order as their model numbers. So it was with the LVT (3), a beautiful piece of engineering, which remained under wraps while the LVT (4) and other Amtracs led the march across the Pacific and some ferried American armies across the Rhine. Then, last Easter Sunday, the Bushmaster went into combat at Okinawa, with the result already described.

About equal to the LVT (4) in tonnage and capacity, a little shorter and beamier, the Bushmaster differs from the Water Buffalo in one outstanding respect. Its driver has practically been relieved from the tricky business of shifting gears in climbing a reef, a beach, or a hillside. For the LVT (3) employs a fluid transmission, similar in principle to those of modern cars, and automatically changes gears to suit the "road."

In round numbers, America has built something over 15,000 LVT's, according to best available estimates. Many more, and for new uses, are due.

Unarmed and unarmored, modified Water Buffaloes and Bushmasters are scheduled to appear soon. They will form the last link of our vast transportation system for reinforcements and supplies across the Pacific, to the forward combat zone where fighting amphibians take over.

Already talk is heard of odd postwar uses for demilitarized amphibians—ferrying logging equipment to hitherto inaccessible timber lands, or leading expeditions in search of rubber, quinine, and valuable minerals. For a while, these fascinating speculations must wait. The amphibians have another job to finish first.

Subscribers in the armed services who notify us of change of address are requested to give us the key symbols appearing on the wrapper in which the magazine is received.

A Flying Vacation (Continued from page 135)

"LAWRENCE." An arrow under it pointed south.

"But that can't be the direction of the airport," said Groenhoff. "It doesn't agree with the map."

We found the airport, after a hunt, a quarter of a mile away. The sign on the barn top pointed to the town of Lawrence. It was for motorists.

Gradually it was dawning on us why the grass airports for private flyers scattered throughout the country were, by and large, unmarked. The local operators on them, who doubled in brass as airport managers, made their money by selling instruction time and retailing airplanes. They weren't accustomed to itinerant traffic. They were penny-wise and pound-foolish. What good was it going to do them to teach people to fly and to sell airplanes if the planes couldn't go somewhere in safety?

Yet, with one exception—at a field run by a bilious, aging gentleman who didn't want to be bothered—every one of the operators went out of his way to help us. The Hutchinson man called the weather station for us. The wife of the man at Lawrence argued on the telephone until she got us a hotel room. The operator at Garden City took us sightseeing in his car. The one at Du Bois, Pa., drove us into town for lunch, and the one at Chicago left one of his own planes out in the open overnight to give us hangar space.

On our last lap but one to Chicago I warned Groenhoff, at the controls, "Someone may have thrown a switch at the next railroad, crossing. Watch out or you'll get off on the wrong track." He grinned.

We crossed a crossing. Five minutes later I glanced at the compass. "Where do you think you're going?" I asked.

Someone, sure enough, had thrown a switch. It took us ten minutes of diving on railroad stations to see if we could read the signs, of map study and radio-beam orientation, before we got back on course.

I directed him to an airport. "Where are we?" he asked, as we landed for fuel.

"Burlington,"

"Burlington what?"

"Iowa."

"How did we get into lowa?" When you fly several hundred miles between stops, your geography gets mixed up.

At Chicago we had to hunt for the airport for only five minutes. It was a record.

At Sandusky, Ohio, we swooped down on one of the finest private flying fields that we encountered in the whole trip. "But why don't you put a big white circle on the field?" I asked the manager. "It would be good for business."

For answer he beckoned us into his car. He drove out to the center of the field. There was a circle there, all right. Time had dimmed it.

"As soon as I can get help," he said, "that circle will be fixed up."

The radio battery was going dead. We stopped at Cleveland for a new one. Jim Borton, manager of General Airmotive Corp. and an old friend, shook his head. The war, he said.

"I don't relish flying over the Alleghenies without a radio," I told Groenhoff. "You did it two weeks ago," he reminded me.

That Canadian air had moved east. The ceilings were lowering. Over mid-Pennsylvania I was doing the flying. Groenhoff was navigating.

"Let's get down," I said. "The stuff is on the mountaintops."

"There's an airport three miles ahead of us," said Groenhoff. What a navigator! We put in at Du Bois and waited for the stuff to lift.

The clouds went up just enough, no more. It was touch-and-go flying. Bits of cloud whipped by the wings. I flew generally eastward but dodged here and there, looking for clear spots in the sky.

"Go ahead," said Groenhoff. "Fly where you want to. I'll follow you on the map," If you don't think he had a hard job, try it some time.

Presently he said, "This next ridge is the last big one. We'll hit a series of nice valleys. It will be clear sailing from there on."

It was, too. Spasmodically the sun came out. I rocked the wings and did roller-coasters with the elevator.

"We never could have gone as far as we did in so short a time in an automobile," I said.

"It is generally conceded," replied Groenhoff, "that an airplane is faster than an automobile."

I looked across at him. He was sober-faced.

In our two weeks' air vacation, we had covered 3,430 miles in 52 hours and 20 minutes of flying time—which gave us an average travel speed of 65½ miles per hour. The costs chargeable against the plane (fuel, oil, hangar rent, repairs, phone calls, and taxi or bus fares) came to \$123.28. That made the operating cost per mile a little less than four cents—two cents for each of us. A bargain, we called it.

manufacturers. The Lowell, a short-lived type, followed the Gardner. In 1885 Hiram Maxim displayed his machine gun, which was followed by the Hotchkiss.

The Maxim introduced several revolutionary features to the automatic-weapon field. The action, for the first time, was completely automatic. The gunner merely pulled the trigger; the weapon fired, recoiled, ejected the spent round, reloaded-and repeated the performance as long as the ammunition was fed.

Another feature of the Maxim was the single barrel. A water jacket completely surrounded this one barrel and cooled it. Combined with these developments was a new-type feed. All feeds previous to the Maxim had depended upon gravity, but this weapon took its shells from a canvas belt which ran through the action from a box. This combination of water cooling and beit feeding increased the sustained rate of five. The Maxim was the forerunner of modern

automatic weapons.

Closely following the Maxim, John M. Browning developed the Colt Browning automatic gun, which was adopted by both the Army and Navy and was used extensively during the Spanish-American War. The Browning was an air-cooled weapon. It used the gas of an exploding cartridge, which was diverted through a small port in the barrel, to drive a piston sliding in a cylinder attached below and parallel to the barrel. This, in turn, actuated the operating mechanism. This American weapon also was used by most of the European nations.

In 1906 the Schwarzlose machine gun, manufactured in Austria, was hailed as an innovation in automatic arms. It was modeled after the Maxim gun, but was greatly

simplified.

The Lewis gun, invented by an American Army officer, was adopted by Great Britain as one of its standard machine guns in 1909. Improved models are still in use today. One of the first light machine guns, the early Lewis weighed 2514 pounds and could be fired from the shoulder. A 49-round magazine fed the weapon, which had as one of its outstanding features a type of "forced draft" cooling of the barrel. The Vickers machine gun and the Bren gun are also used by the British Army

Paralleling the Lewis gun was the Madsen, invented in Denmark, weighing only 15 pounds. This weapon was seriously considered for use by the American Army in the 1920's.

During the years preceding America's

entry into the First World War, it became increasingly apparent that the United States needed automatic weapons of its own design. The line of Browning automatics was the answer. The Browning Automatic, or BAR, was similar to the Madsen but has proved superior. The second of this family was the Browning water-cooled machine gun, which was the standard heavy machine gun of this country in the First World War, as it still is today.

The M1919A4 was the fourth of the series. A heavy barrel, surrounded by a ventilated jacket, dissipates heat fast enough to fire comparatively long bursts without burning out the riflings. However, it cannot fire for as long periods as can the water-cooled

The Browning .50 caliber machine gun completed the balanced automatic-weapons group. This long-range, heavy-hitting weapon helps to make America's warplanes among the most heavily armed in the world. Other models with longer barrels are mounted on trucks and half-tracks to battle enemy aircraft attempting to strafe motor columns and beachheads. Water-cooled models hurl luminous streams of tracers from antisircraft mounts on ships at divebombing pilots.

These are by no means all the automatic weapons in America's bag of fighting weap-

ons, but they are the basic types.

The Japanese have developed a complete line of automatic weapons. They are named after their inventor, Nambu—who, incidentally, picked up some of his ideas from foreign arms. Many of the weapons used by the Nips were captured at Singapore, Hong Kong and Manila, and the weapons of almost every nation have been found on Pacific battlefields. For lightness and efficiency in jungle areas the Japanese weapons are considered good, but in obtaining this lightness the Japs sacrificed hitting power. They began a late change-over in their weapons from the .256 caliber to .303, which is slightly larger than the American .30 caliber.

Development of the machine gun has faced certain limitations. These are primarily cooling and ammunition supply. The watercooled barrel and the air-cooled barrel are at present the only answers to the problem

of overheating.

models.

The trend in automatic arms is toward lightness and mobility. The earlier weapons strongly resembled the cumbersome artillery of the time, while today's machine guns are streamlined and light enough for both jungle and mountain warfare.

Outwitting the weather

%

How science copes with Old Man Weather is illustrated by these ideas and devices from General Electric

laboratories.

How high are the clouds? A cedometer measures this for airmen. How wet is the weather? A fungus farm in a G-E laboratory helps design military equipment to resist fungus in the world's wettest areas.

On this page are a few more examples of the way General Electric research and engineering are being devoted to this phase of human comfort and health. General Electric Company, Schenectady, N. Y.



Cloudy but bright. When clouds darken the sky, lights come on in this schoolroom. No one has to remember; a General Electric automatic light control with an "electric eye" keeps constant watch on daylight, safeguards young eyes by turning on the lights whenever they are needed.



Cusumber megic. Vines in electrically heated soil (right) grew twice as tall, and here one mouth earlier. The heating cable, developed by G-E engineers, is buried in the soil and thermostatically controlled. More than 15,000 commercial growers use G-E soil-heating cable.



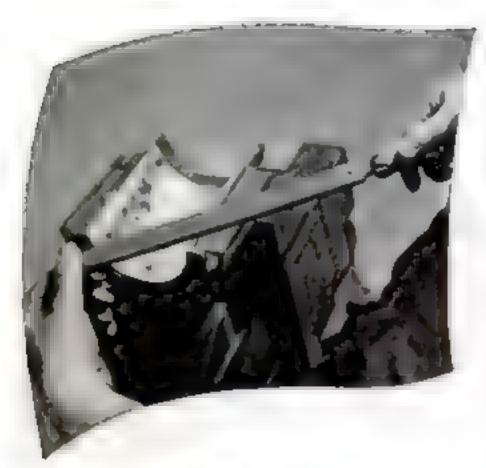
Weather detective goes aloft in the small box suspended from the balloon. Some 12 miles up the balloon bursts, and the box is parachuted back to earth. On the way up, thus electronic device, called the G-E Stratometer, gives a running commentary on the weather—temperature, humidity, air pressure—and sends this information back to earth by radio signals. The information gathered by the G-E Stratometer can be used to help predict the weather.

 \star

Hearthe G-E radio programs: The G-E All-girl Orchestra, Sunday 10 p. m. EWT, NBC—The World Today naws, Monday through Friday 6:45 p. m. EWT, CBS—The G-E House Party, Monday through Friday 4:00 p. m. EWT, CBS,

FOR VICTORY-BUT AND HOLD WAR BONDS



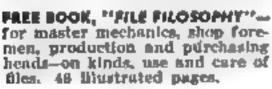


THE FILE THAT "FLOATS"

Yes, a file that smooths soft metals like lead, beblitt and pure copper is commonly known as a "float file." In the Nicholson Lead Float, the extra-coarse, extra-short-angle, single-cut teeth are practically a series of stubby "blades" which shear away metal rapidly. Light pressure produces the smoothing effect.

In the machine shop the Lead Float is used on soft bearings, shims and molded parts. Plumbers use it on lead pipe fittings, solder joints, etc. Ship-builders use it on lead and copper piping installations.

Every mechanic should be familiar with this special purpose file. . . . In Nicholson or Black Dismond brand he'll have it in unveryingly accurate cut and finest quality. It is one of many special purpose files with which Nicholson is helping to speed industrial production and increasing mechanics' efficiency and earning capacity.





MICHOLSON FILE CO., 18 Acorn Street, Providence 7, R. L.

FILES FOR EVERY U.S.A.

Radar Sees the Invisible

(Continued from page 71)

bombers could be detected soon enough for defending fighters to intercept them. After the fighters took off, they had to be guided along a course of collision or interception so that they could find the bombers in the dark. During the Battle of Britain, the night fighters did their best work after making visual contact by the light of the moon or in the reflected glow of burning London.

In the Black Widow episode at the beginning of this article, part of the trick was identification. An airplane or ship looks the same in the radar operator's scope, or "scan," whether it is friend or enemy. This uncertainty is eliminated by auxiliary radar apparatus known as "IFF" (Identification of Friend or Foe). All Allied aircraft and vessels carry a specially designed radio transmitter and receiving unit called a "transpondor," whether or not they are provided with any other radar equipment. When we detect something with our radar, operators send out a challenging signal that says, in effect, "Give the password and be recognized."

This challenging beam enters the receiving unit of the plane or ship being queried and passes on to the transmitting unit to spring a triggering device. The automatic action causes a friendly plane's transponder to emit a series of properly coded signals which are picked up on the challenger's scope. If it is the right code of the day, or the hour, a certain pattern is then formed on the scan of the questioning radar set. If no pattern, or the wrong one, appears, the detected object is considered hostile.

IFF sets can also be used as an aerial guide or beacon to lead other planes without the enemy's knowledge. By setting a switch, the RO causes the transpondor to send forth a series of steady signals that say to other planes—merely through the pattern on the scan-"Come here," or "Follow me." Craft tuned to the proper frequency can "home" on this plane just as they would head toward a beacon on the ground. Thus, it is possible for a pathfinder or a formation leader to beckon other planes to the spot where he locates the enemy fleet in hiding without tipping his hand to the foe. When a pilot is forced down, this homing signal can also be used to attract rescuers.

Paratroopers and glider units use a condensed version of IFF for landings in hostile country. A pathfinder transport locates the most suitable drop zone and one or two paratroops are dropped carrying with them

(Continued on page 214)

LIGHTER MOMENTS with fresh Eveready Batteries



"Which one of youse guys is 'cutie-pie'?"

"EVEREADY" No. 6 Dry Cells continue to provide dependable power for the vital field telephone equipment of our Armed Forces.

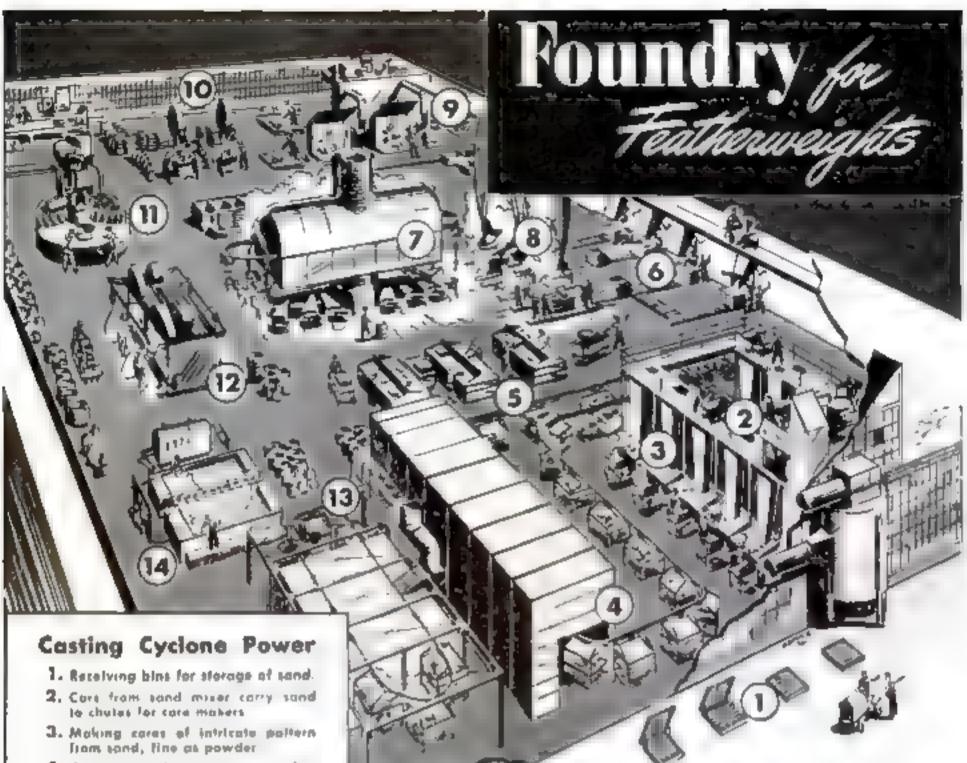
But you'll be glad to know they are available in increasing quantities for civilian use—fresh, full-powered, long-lived as always. Ask for them at your dealer's now.



Let's get the Jap—and get it over!



The words "Evereadu" and "Ignitor" are registered trade-marks of National Carbon Company, Inc.



- 4. Centinuous choin tenveyer taket teres through baking even
- 5. Doed cores ore parembled
- 6. Assembly of cores and mould
- Oil fired furnaces mell magnesium, kept covered with flux of bords and sulphur to prevent burning.
- 8. Pouring malten magnesium at ex-
- 9. Shake out screens remove casting, also sand for reclaiming
- 10. Sow cuts excess metal from costing
- 11. Sand blasting, casting inspection
- 12 Surring and granding rough spall and inspection
- 13. Conveyor takes castings through heal treating furnous
- 14. Compressed air test under water checks any possible flows and cracks.

Magnesium is a metal one third lighter than aluminum, strong as iron. In this Wright Aeronautical foundry, it is melted and cast into parts for Wright Cyclone aircraft engines.

On a bomber powered by four Wright Cyclones, use of magnesium saves enough weight to add two extra gunners, or 75 more incendiary bombs, or two additional barrels of gasoline for more range.

A pioneer in casting magnesium, Wright Aeronautical uses this metal as one more means of adding speed, range and load to planes by building powerful engines without dragging weight,



Send for "ENGINOLOGY"-25€

Charm to the and the internation of the control of

Wright Aeronautical Corporation Dept PS, Palerson 3, New Jersey

WRIGHT AIRCRAFT ENGINES

Bhrision of

CURTISS WRIGHT

FIRST N PL GHT

Here's how your car feels after MARFAK chassis lubrication

THE REASON WHY: Texaco Marfak lubricant provides a tough, adhesive film that cushious chassis bearings against road shocks, increasing the riding comfort of the car and adding substantially to its life, Marfak maintains its consistency at the outer edges of the bearings, sealing itself in and sealing out grit and dirt.



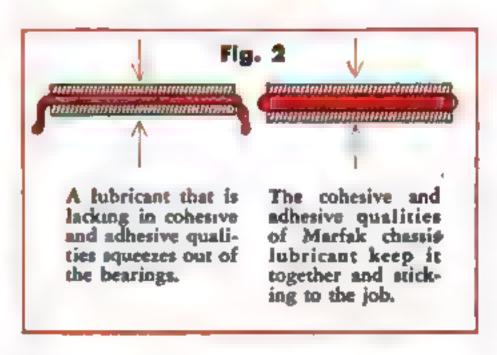




Mariak cushions the blow, sticks to the job, doesn't spatter when given the hammer test. Ordinary lubricant spatters in all directions, flying away from the job.

Marfak chassis lubricant is scientifically designed to fully protect bearing surfaces against the destructive action of friction and road shock. You can feel its cushioning effect as you drive. Marfak has cohesive and adhesive qualities that make it cling to bearing surfaces





and resist any tendency to wash-out, jar-out or squeeze-out, see Fig. 2.

Turn to Marfak protection today!

THE TEXAS COMPANY



Don't miss the TEXACO STAR TREATRE on Sunday nights with JAMES MELTON and famous guest stors. See your newspaper for time and station.

You're welcome at TEXACO DEALERS





You'll see when you smoke I.C.

Do the gals go for the magical I.C. aroma? You'll see! With your taste-buds pur-r-r over the magical I C flavor? You'll see ... when you light up the magical Irish Castle mixture of eight of the world's finest tobaccos. Eight, count 'em ... 3 kinds of Turkish, 2 choice Virginias, 1 rare White Burley, 1 Latakia, 1 Perique. Blended by the master of 'em all, Willoughby Taylor. To get the gals—or just to pamper yourself—get magical Irish Castle Pipe Mixture, quick!



SET ACQUAINTED SPECIAL

For a limited time tand only if your dealer is out of stack! we'll send you a half-pound humidar of Irish Castle P-pe Mixture for only \$1.10. Mail coupon with cash or check to Penn Tabacco Co., Dept. PS Wikes Barre, Pa.

Name	
Address	

Radar Sees the Invisible

(Continued from page 210)

a light, battery-operated radar set. This is a small beacon, even more compact than a hand talkie, with a short whip antenna that is set up as soon as they land. Aboard the transports that follow, flashing red lights notify pilots and jumpmasters when the drop zone has been reached.

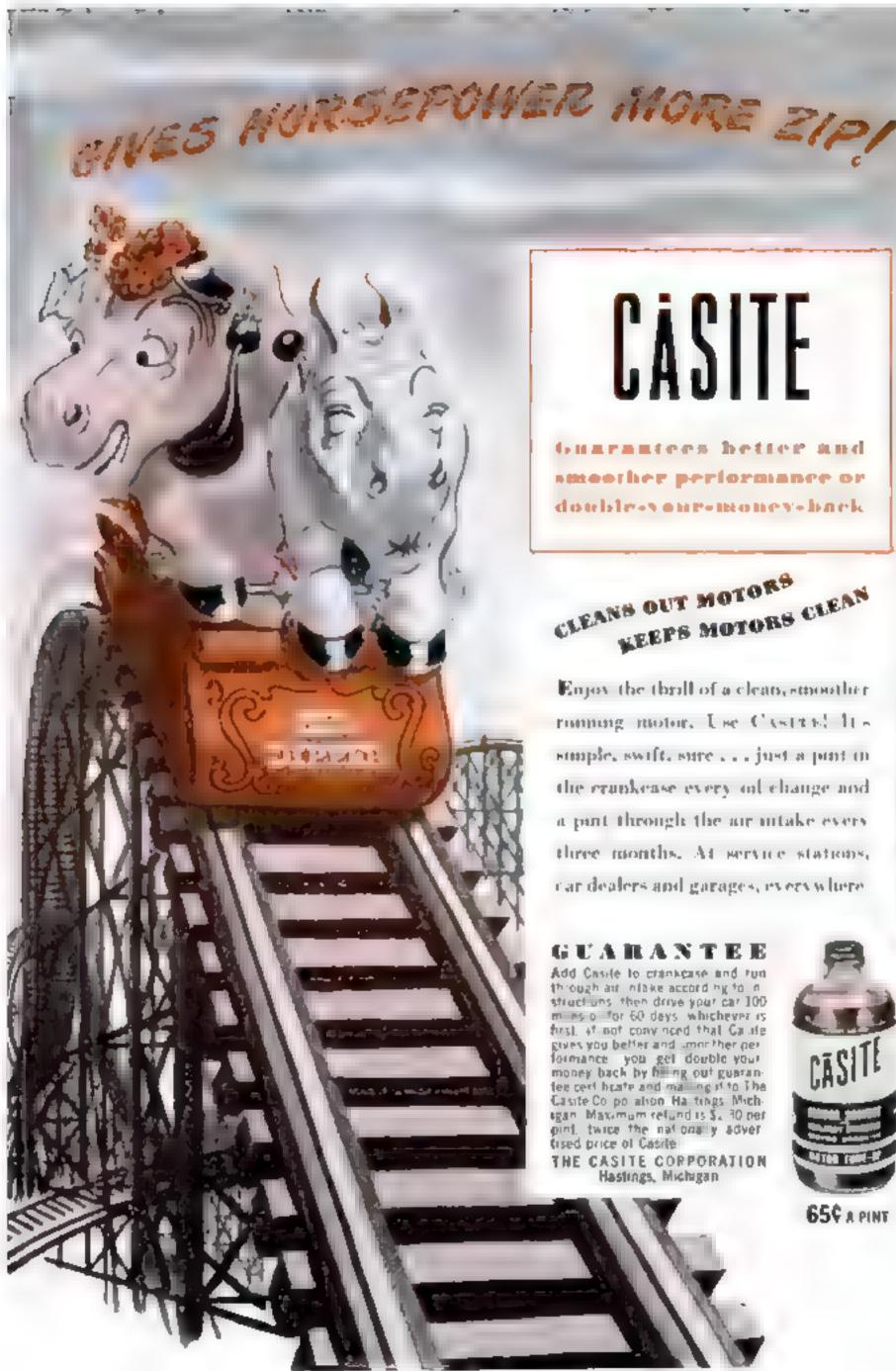
"Racons" are probably the largest RAdar beaCONS in use. Twin transmitter towers are permanently located so as to permit a plane to home on their signals or use them for plotting position. The beacons usually operate only when the beams from an airplane's search radar come in contact with them. These pulses automatically trigger off the beacon transmitters in the two towers.

Complete networks of racons now make possible a new system of long-range air navigation. The plane's special receiver, manned by the navigator instead of the radar operator, is tuned to catch these beacon beams. The pulses are emitted as coded signals, and each beacon has its own identifying code. In the radar scan, the plane's navigator can determine by the light traces the identifying number of the beacon station's beam. Each beam's path is represented as a curved line on a chart. The navigator then tunes in another station to get a cross bearing. Where the lines intersect is the position of the plane.

For the most part, these beacon stations are set up along coastlines; they do not function over long distances inland because of the many "permanent echoes" established by hills and other terrain features. The guiding signals can be picked up at night as far away as 1,200 miles. This new system is considered by many airmen to be just as accurate and much quicker to apply than the standard celestial avigation methods. It can be used in bad weather when there are no planets visible. The stations, each with its twin tower installation, are located from 300 to 400 miles apart, Smaller, intermediate "slave stations" with single transmitter towers are spotted between the main beacons.

There is also a short-range air-navigation system accurate enough to use for area bombing. Stations with single-tower transmitters are spaced close together and permit fixes within a matter of yards. Both the long- and short-range systems were originated by the British and improved to their present state of efficiency by American technicians.

(Continued on page 218)



CASITE

buarantees better and smoother performance or double-vone-money-back

KEEPS MOTORS CLEAN

Enjoy the (brill of a clean, smoother, running motor. Use Castral Itasample, swift, sure . . . just a pant in the erankease every oil change and a pint through the air intake every three months. At service stations, car dealers and garages, everywhere



65¢ A PINT

What every aircraft engineer knows

(The following message is taken from a recent Consolidated Vultee magazine advertisement entitled, "The Joker in Air Power," addressed to the American public.)

Every Aircraft engineer who ever saw the inside of a wind tunnel knows what the joker in Air Power is

The joker in Air Power is TIME—the heartbreaking months and years it takes to design, to build, and to perfect a plane to the point where it becomes an efficient, service-tested battle plane, ready for action.

In aerial warfare, the nation that depends on mere quantity and present-day superiority of its planes cannot win. That is one reason why Germany lost

Progress in aeronautics is now so rapid that today's "hottest" combat plane is virtually

obsolete tomorrow. It must be replaced, with all possible speed, by new planes now on our drafting boards, in our wind tunnels, or undergoing test flights.

These are facts which an alert America should not, must not, forget.

Research and development in the field of aeronautics is an insurance policy on the life of the nation.

And we must not let a single premium lapse!

Let's <u>keep</u> America strong in the Air!

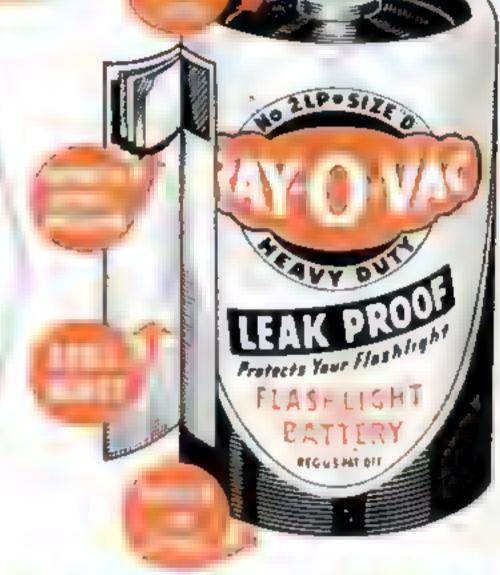
CONSOLIDATED YULTEE AIRCRAFT CORPORATION

San Diege, Calif. Veltee Field, Calif. Forfield, Calif. Tucson, Ariz. Fort Worth, Texas New Orleans, La. Nashville, Tenn. Louisville, Ky. Wayne, Mich.

Dearborn, Mich. Allentown, Pa. Elizabeth City, N. C. Mami, Flo. Member, Aircraft War Production Council



Here's the Patented
RAY-O-VAC
LEAKPROOF
CONSTRUCTION





LEAKPROOF cell."

TEAKPROOF cell."

LEAKPROOF cell."

It's SEALED-IN-STEEL Top, Bottom and Sides

And it's LIAHPHOOF 2 WAYS



Power is sealed in-your flashlight works when you need it, even for years and years.



Ingredients are sealed in—your flashlight is protected against ruinous corrosion and swelling of cells (see guarantee).

MABISON 4, WISCONSIN

STUCK PACEBURES AS CLIMTON, MASS . CARRASSER, BUCK - STUDE COTT 18WA - FORD BU CAC, WIS . MICWAUREE, WIS . RANSAS COTT ME



of the waterproof watch you never have to wind!



You'll tell accurate time with this Croton Waterproof Aquamatic. But you'll never have to wind it, because it winds by itself! The natural motions of your wrist do it. Therefore, your watch is always wound — always on time.

ACTUALLY 13.5% MORE ACCURATE

A famous laboratory proved it. Three Craton Aquamatics in a 30-day comparison test were reported 13.5% more accurate than the average of nine well-known stem-wind watches when checked against a standard time signal You've dreamed about this kind of "automatic" timekeeping—now you can have it!

This Croton has everything. Weat it when you bathe or swim, it's waterproof—shock resistant, tarnish proof. Also radium dial, sweep second hand, unbreakable crystal. Everything you want in a fine 17-jewel watch (plus self-winding) for only \$49.50. **set. Text bot.

P. S. Write for Booklet 120. Croton, 48 W. 48th St., N. Y. 19



Radar Sees the Invisible

(Continued from page 214)

The basic radar equipment for distant reconnaissance and navigating is known as the ASV (Air to Surface Vessel) search set. This employs the fully rotating dish antenna mounted in a radome. For this type the RO has a circular PPI (Plan Position Indicator) acope that provides him with a maplike representation of the area below, clouds and darkness notwithstanding. The operator can discern land features such as peninsulas, headlands, or islands as far as 150 miles away; ships can be picked up 50 miles distant, and a fleet can be spotted at twice this distance. A switch is used to open the center of the scope to reveal the detail of targets close at hand. The newer ASV sets, are so sensitive that a welltrained RO can detect cloud formations and weather fronts.

The use to which this search set can be applied in bombing should be obvious. In the dark of night, in fog, or through heavy layers of clouds, the PPI tells the operator what is below and thus enables him or the navigator to see landmarks and spot the bombing target. The regular search set is used for these BTO (Bombing Through Overcast) operations, in combination with an H2X ranging unit and a bomb computer that is part of the Norden bombsight that accomplished such accurate visual egg-laying.

The city that is the target can be picked up 50 miles away by the radar operator in his PPI scan. He directs the pilot over the intercom during the bombing run. As the blob of yellow light and shadow that form the target's pattern slide beneath a heading line and ranging circle that are projected onto the PPI screen, the RO keeps the bomber on course. When the line and circle intersect, he releases the bombs. The "eggs" can also be set for automatic release when the proper point is reached.

In October 1944, when Flying Fortress pathfinders led the formations to raids on Vienna, Klagenfurt, and Munich, the Germans found out that no respite was to be gained from cloudy skies over the Reich. The Japs have since found out that even their foul brand of weather is no guarantee against Superfortress visits. "Micky," as the American version is called, is good for BTO missions anywhere from 12,000 feet to altitudes above 40,000 feet, if we ever have to fly that high.

Another technique was developed by the medium-bomber men of the 5th Air Force

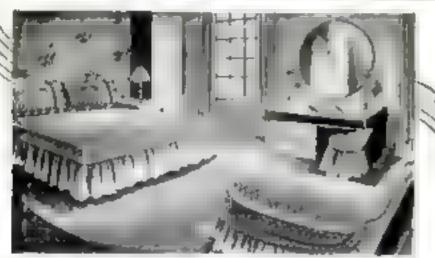
(Continued on page 222)



that flows

T O





As your bedroom colder than you like it on winter mornings? Is your bathroom as warm as you would like it for the early morning shower or the evening tub? Are your halls drafty and cold? Chances are that your home suffers from one or more of these discomforts, which are impossible to cure with the present "on and off" control of heat supply.

But cheer up! There is good news ahead, Modeflow, the amazing new control system developed by Minneapolis-Honeywell, will provide a continuous flow of modulated heat to every nook and cranny of the modern home. It can be easily and mexpensively installed in your present automatic heating system, whether coal, gas or oil.

Before you build your new postwar home, or modernize your present one, be sure to investigate Moduflow. Mail the coupon today for the interesting booklet, "Heating and Air Conditioning the Postwar Home."





SEND FOR THIS BOOK

finnespolis Honoywell Rog. Ca.

1912 Fourth Avenue South Minneapolis 8, Minnesota

Please send my free copy of "Heating and Arr Conditioning The Postwar Home"

B71777 2 2 17	Contracting The Total Man STANS
Name	
Address	
Come	Γ

Let's Finish the Job — Buy MORE Bands!



H. C. RAPP USES HOME SHOP for VITAL WAR PRODUCTION

How a hobby was put to the good use of making over 13,000 radio and special instrument parts is the interesting story of Howard C. Rapp, Mechanical Engineer of Cincinnati, Ohio.

"Homestead Crafters"

Before the war, Mr. Rapp spent many a pleasant and profitable hour working with his daughters on a variety of wood products, using the proceeds to add to his shop equipment. They were getting quite a reputation as the "Homestead Crafters."

When Uncle Sam asked home shop owners to use their tools and talents in war production Mr. Rapp tried, but could find nothing to do on his strictly woodworking equipment.

Worked On Night Shift

So he made the next best contribution and for 15 months worked four nights a week and Saturdays in addition to his important daytime job. When the night shift was taken off, he was told he could have plenty of work to do at home if he had a metal-working lathe.

With orders in hand he went to the W.P.B., secured a priority, purchased an Atlas lathe and has been busy ever since.

"My only regret," says Mr. Rapp, "is that I did not make such a purchase several years ago ... I cannot speak too highly of my Atlas, My work calls for close tolerances and I am able to carry out this work in a fast, precise manner."

* * * *

With industry thoroughly sold on the value of subcontracting many men plan to fulfill their life's ambition—a small business of their own—after the war. If that is your plan low cost Atlas tools will help you get started with a small investment.

SEND FOR FREE CATALOGS
Get full details on the Atlant
4 Tool Team — Jathe, milling machine, shaper, drill press.



ATLAS PRESS CO.

55 N. Pitcher Street, KALAMAZOO 13D, MICH.

SAVE WORK!

... Yet Have Lovelier Floors



Self-Polishing Simoniz Shines without Rubbing . . . Gives Longer Lasting Luster

Den't envy others. Your floors can be as brightly spotless os the best of thom-and ah so ausilyl Merely flow Self-Polishing Simeniz onto your floors. No rubbing -no polishing-just let it dry. Then—Prestol—Shimmering leveliness that lasts and fasts. Self-Polishing Simoniz doesn't wash off and have to be replaced gvery few days. It wears, in fact, much like the original SIMONIZ long fomous for enduring beauty en automobiles. Cleaning's se easy, too. A damp cloth whisks off dust and dirt and your floors shine like new again. So, do try Self-Polishing Simoniz—but Sooni Sold by grocery, hardware, drug, point and department stores everywhere. The Simenis Company, Chicago, III.



Radar Sees the Invisible

(Continued from page 218)

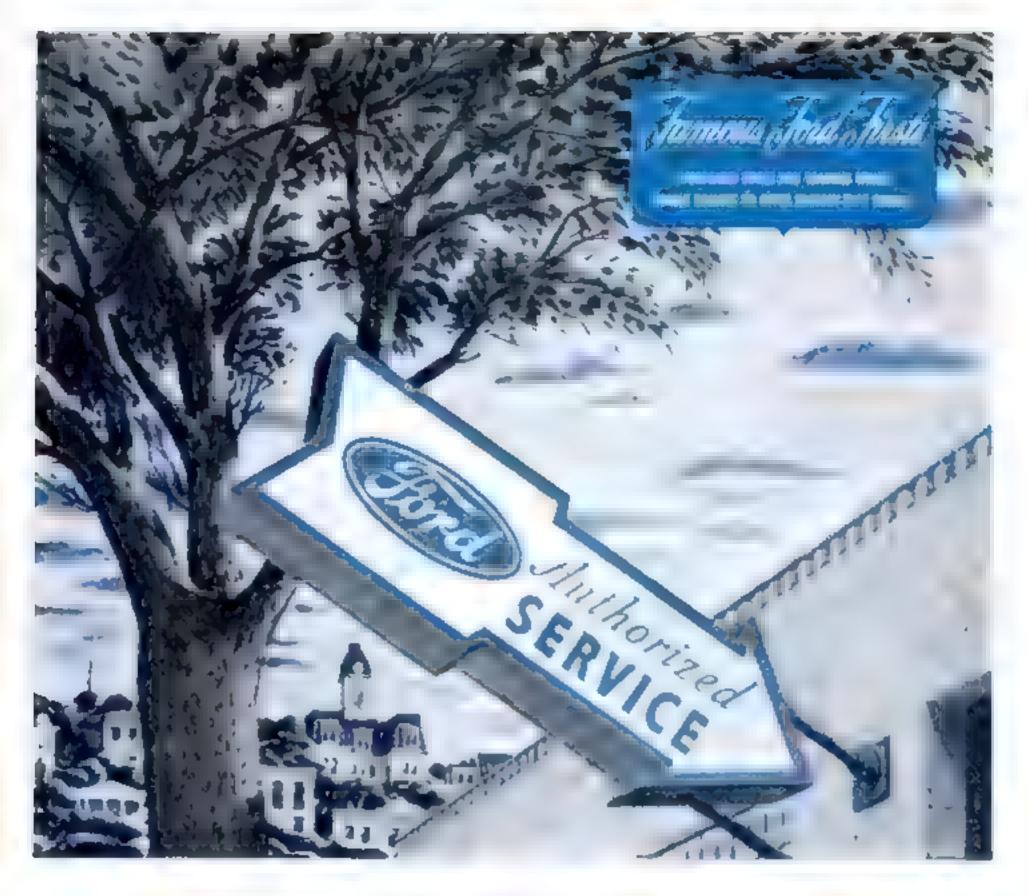
in the southwest Pacific for attacks against Japanese shipping. Their LAB (Low Altitude Bombing) equipment is connected with the plane's regular set and consists of a computer, a tracking unit, and a repeater scope for the bombardier. LAB can be used from any altitude between 50 and 2,000 feet at night or in conditions of low visibility. And no one knows better than the Japa, who tried to run merchantmen and warships through our serial blockade, the efficacy of this automatic radar bombing apparatus. LAB is operated in much the same manner as the high-altitude BTO set.

When enemy bombers attempt to attack our ships and ground installations, we put radar to work defensively. Mobile radar sets are hooked up with searchlight synchronizers called "comparators." The beams pick up the planes and aim the lights at them. Accurate antiaircraft fire depends largely upon accurate ranging and computation of speed and direction. Radar can do this as no mechanical computers ever could. In the case of shipboard dual-purpose and automatic 40-millimeter guns, the additional factor of the ship's pitch and roll must be taken into account. This is done through the use of gyro stabilizers that are hooked up to the radar fire-control equip-Each type of gun aboard ship usually has its own set and antennas; there is one radar for the five-inch guns, another for the 40-mm. guns, and gunnery officers and radar operators and trackers for each of the sets.

The story about radar being used to catch fish is credible because of the effect of microwaves on the delicate sense organs of fish, but radar has been accused of much that is fust not so. It will not make operators baldheaded or sterile, nor will it cause RO's to go crazy after being around the apparatus for a time. One woman in the West called a major of the 4th Air Force recently to complain that ever since the AAF put radar on training planes she had been having trouble. When the planes flew over her house, she said, their radar made her telephone hard to hear, made the bedsprings squeak, the radiators get noisy, and killed all the pretty fir trees around the house.

When the time arrives for radar to cease killing either fir trees or Japs, it will become a boon to mankind in the one medium most essential to international goodwill and understanding—communication.

On land, at sea, and in the air, radar can (Continued on page 226)





with a factory program for universal service



Henry Ford long ago declared:
"A sale does not complete the transaction between us and the buyer, but establishes a new obligation on us to see that his car gives him service."

Early, the Ford Motor Company saw the need for personal service, precision tools, trained mechanics. From all over the world men came to the Ford plant for service method training. In a sense, they took with them part of the factory itself, methods and ideals, and thus Ford service became universal.

Through the development of special-purpose tools and scientufic methods, Ford was first to

make it possible for dealers to give service measuring up to the precision built into the original car. Today Authorized Ford Service dealers everywhere have available a complete line of factory-approved tools that mean finer workmanship, greater economy for the car owner. And the Ford Motor Company continues to supervise the training of men who will use these tools.

Here is one more of many important Ford "firsts." It is paying extra rewards to owners under wartime driving conditions.

"THE FORD SHOW" Singley stars, orchestra and charas. Sanday, complete MEC antends, 2:30 P.M., E.W.T., 1 P.M., C.W.T., 12:30 M., M.W.T., 11:30 A.M., P.W.T.

EXPECT THE "FIRSTS" FROM FORD!



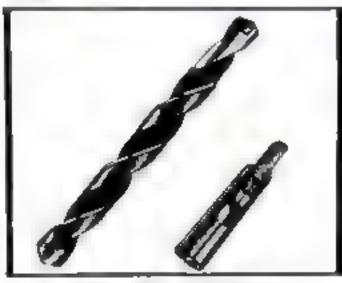
New Shankless Roll-Forged Drill is Faster, Tougher, More Economical

Developed by Ford for wartime uses—available now to industry in general. "More holes at less cost," is the claim for this ingenious new Shankless high speed drill—made in two parts—the drill itself, and a removable taper shank, known as the "drill driver." By this separation, costs to the user have been cut 20% to 30% under conventional tapershank drills. In the conventional drill, the shank must be discarded when the point and flutes are worn out. Here, however, the drill driver is used throughout the lives of many drills. Shankless drills are roll-forged and twisted, unlike the machined manufacture of ordinary drills, for improved structure.

Principal advantages are (1) Lower first cost. (2) Greater hole production because of greater strength. (3) Reduced breakage with tough "shock-absorber" neck. (4) Greater length of usable flute. (5) Greater scrap recovery value of unused portion of drill.

Wartime advantages of Wrigley's Spearmint Gum show how this quality product, too, can help industry—once it again becomes available. In the meantime, no Wrigley's Spearmint Gum is being made; and none will be made, until conditions permit its manufacture in quality and quantity for everyone. That is why we ask you to "remember the Wrigley's Spearmint wrapper," as the symbol of top quality and flavor—that will be back!

You can get complete information from Republic Drill & Tool Co., 322 S. Green St., Chicago 7, Ill.



Shankless Drill and "Orlit Driver"



Remember this wrapper

7-61



One of the great dramatic moments in railroading occurred when the Cotton Beit changed the gauge of its 418 miles of track in a single week end. The scene pictured above is our artist a conception of the closing hours of this successful old-time race against time.

CHANGING THE MEASURE OF RAILROADING

It was September in 1886. All along the Cotton Belt, from Bird's Point, Mo., to Texarkana, old spikes came out. Rails were shifted. New spikes sank home under swinging hammers. The entire railroad was changed from narrow to standard gauge over one week end. The Cotton Belt had stepped along with the times.

This railroad is still stepping along. It is one of 83 railroads and major industries where General Motors Diesel locomotives are changing the measure of railroading.

Watch what happens when complete lines and systems are GM Dieselized. Far faster freight hauls. Quicker, more comfortable, and more reliable travel for passengers.

And reduced maintenance by sturdiness that goes a million miles or more without major overhau!!

Yes, the measure of railroading is changing - for the better. And GM Diesel locomotives are helping to bring about this new benefit for the railroads, for the country, and for you.

One More War to Wie Buy MORE Bonds



LOCOMOTIVES

.. ELECTRO-MOTIVE DIVISION, to Game III

DETROIT DIESEL ENGINE DIVISION Detroit 25. Mich

EMBANES 150 to 2000 HLP ... CLEVELAND DIESEL ENGINE DIVISION, Claveland II, Obio

Make this simple test! See why you

CET MORE HEAT



FROM LESS FUEL



with the genuine ESTATE

HEATROLA HEATER



Before you buy any home heater . . . see the genuine Estate Heatrola Heater . . . the recognized leader

for over 20 years. Circulates healthful warmth throughout the rooms...makes less fuel go farther.

THE ESTATE STOVE COMPANY, Hamilton, Ohio

Your best buy is the best you can buy

ESTATE HEATTOOLA HEATER

FOR COAL, WOOD, OIL

Radar Sees the Invisible

(Continued from page 222)

be applied to all sorts of postwar transportation. It will find its widest application in the aviation industry, because of the three-dimensional character of flying. The CAA is experimenting at Indianapolis with a commercial adaptation of the "BABS" (Blind Approach Beacon System) device used by the AAF and Navy for landing planes in the thickest pea-soup fogs. Airport control officers can be provided with a large master scope that will show, even in bad weather, all planes in the vicinity of the airport. Airliners and personal planes can carry their own navigating and detection equipment to make flying safer and easier.

Steamships equipped with radar navigational and detecting devices can maintain faster schedules in bad weather, locate icebergs and other obstructions, pick up shore lines and shoals, and check on the location of other vessels to avoid collision.

Railroads can apply radar for signaling, the automatic stopping of trains when tracks are obstructed, and locating trains on a master board in the dispatching and traffic-control offices.

Autoists may find that radar devices will enable them to drive at reasonable speeds through fog and atorms. One unit might serve as a guide to keep the car on the road, flashing a warning light when the driver gets too close to the edge; another would scan the road ahead for obstructions or other cars.

Manufacturers can apply radar in a number of ways. Fisheries can make use of the devices—and certain other apparatus which is not strictly radar but closely allied to it—to locate and catch schools of fish with this "electronic bait."

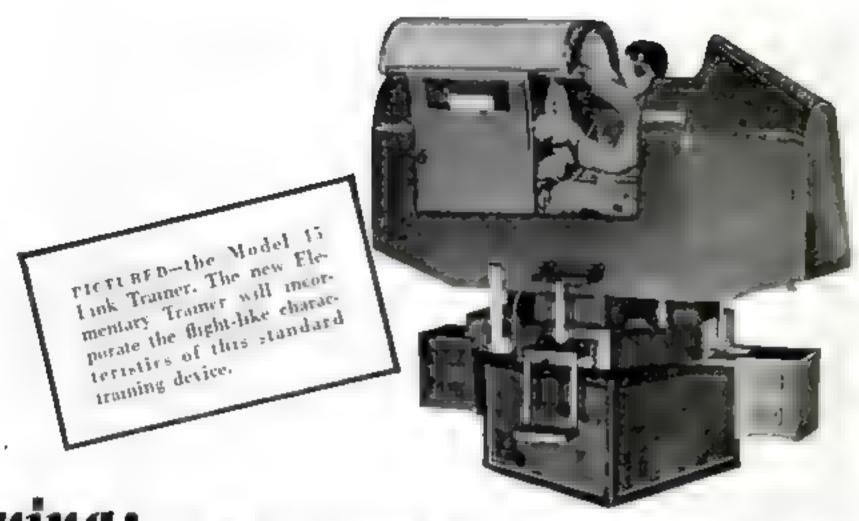
Indeed, radar may be the most significant contribution to the amazing new electronics industry that bids fair to become one of the keystones of modern living.

MAGAZINES FOR NAVY MEN

The Navy is sending free "Overseas Edition" kits of current magazines to thousands of land stations and ships at sea, and asks relatives and triends of Navy personnel and Seaboos not to send private subscriptions to the Pacific. This will (1) ease the tremendous mail load, (2) permit letter mail to go through quicker, and (3) give our fighting men newer magazines.

to A. D.

directly over the flame



Coming: New Elementary Trainer for school use

This war has proved the extraordinary value of training devices—in saving lives, time and money. Our fighting men are the best-trained in the world, due in no small measure to these devices which simulate military problems and help to teach their solution.

The Link was the first training device to simulate the characteristics of an airplane. It is the standard trainer for all pilots of our air forces and commercial air lines. Twenty years of experiment and engineering have brought it to a high degree of perfection.

Now Link engineers have developed a new Elementary Trainer, ideal for school and classroom use. It enables students to study the basic elements of aviation—safely, on the ground. It is a real Link, with all the flight-like features of the standard trainer. Yet its cost will be well in range for school budgets. It will be available soon after wartime restrictions are removed.

May we enter your name for descriptive literature, to be sent you as soon as it is off the press?

Link Aviation Devices, Inc.

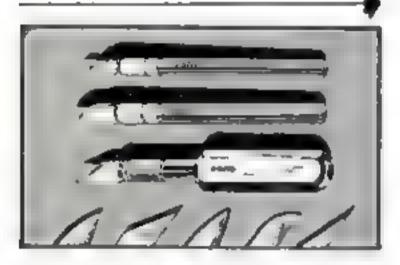
BINGHAMTON, NEW YORK

MAKERS OF LINK TRAINERS, CREW NAVIGATION TRAINERS AND OTHER DEVICES CONTRIBUTING TO THE SAFETY OF FLIGHT.

NEW X-ACTO TOOLS TERRIFIC SENSATION IN HOBBY AND CRAFT FIELD

It had to come! People who once discovered the dependable exactness of X-acto Knives simply would not be satisfied till they got companion tools of the same precise perfection.

So here they are, designed with scientific accuracy, made to X-acto's topnotch standards in every detail. These are tools every handicrafter needs, whether his interests less to model-making, carving, gadgets or whatever. Make them standard equipment for your hobby desor workshop, and get slicker jobs done quicker.



WHEN YOU NEED A KNIFE YOU NEED X-ACTO

Always sharp, always ready. Three easy-grip knife styles. Eight scalpel-sharp blade designs, interchangeable, replaceable in 5 seconds. The knife preferred by expert modelmakers, whittiers, draftsmen, artists and photographers. Cuts paper, wood, or plastics with equal case. Does a multitude of jobs—better, faster, safer.





KNIVES

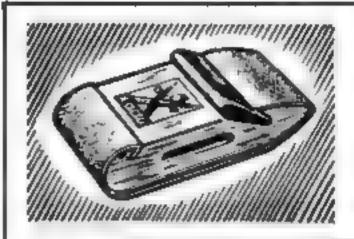
At better hardware, hobby, and gift shape

-or if not available write direct to X-acto Crescust Products Co., Inc. 440 Pourth Ave., New York 16, N.Y.

X-acto Knives and Knife Chests From 50¢ to \$5.00

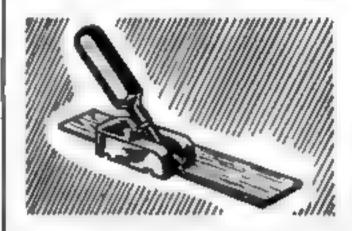
SEND FOR THESE HELPFUL HANDBOOKS

(1) Boat Whittler's Handbook. (2) How to Build Scale Model Planes. Full of helpful ideas. Only 10¢ each.



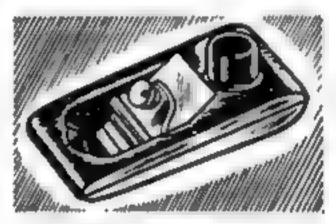
The X-acto Sander

A good-looking, handily shaped solid block of wood, with rubber pad for round edges, and three grades of first quality sandpaper. 6 refills. Complete 50¢. Refills, 6 pcs., 10¢.



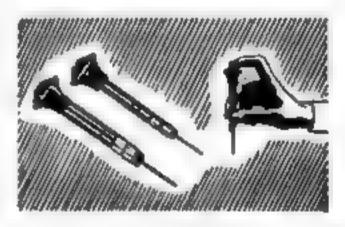
The X-acto Balsa Stripper

Aeromodelers' indispensable. Cuts straight, square, strips; thin or heavy stock, Movable guide regulates width. Use with X-acto knife. Pays off on a single job. \$1.00 (without knife).



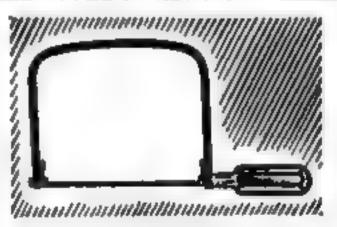
The X-acto Planer

Cuts like a charm. So easy to handle. A real precision tool, shaped like a tank, fits ma hand. High-temper surgical steel single-bevel blade. The craftsman's delight. Complete \$1,00,



The X-acto Hand Drill and Pin Vise

All-metal tool takes any drill from mallest mells up to 3/32" diameter. Free wheeling knob, diameter knowling on handle sasure easy manipulation with fingers. 75¢.



The X-acta Hobbycrafters' Saw

Sturdily constructed, indispensable. Easy-grip duraluminum handle holds blade always taut. Blades are sharp and efficient, removable, quickly changed. Complete, \$1.25.



The Century Gas Gun was developed to meet the demands of War Industry for soldering and brazing equipment to speed up production. Now, for the first time, it is available for civilian use This Gas Gun is absolutely unique—there's

never been anything quite like it. Anybody can operate it with ease, speed, safety. And with economy, too! For, thanks to the Century Gas Gun, you can now do 101 home repair jobs yourself. The money you'll save on just one job will more than pay the total cost of the gun. Use the handy order-coupon below for quick action!

Gan with anough flints for over 2,000 tightings. If you want the regulator, hose, clamps and extension nosate, send \$17.30 additional. Your local gas distributor can supply necessary acetylene tank.



FOR AUTO REPAIR



FOR HOBBY SHOP

SAY KAISER SHIPYARDS

ALUMINUM COMPANY OF AMERICA...
and hundreds of other big users. The
Gas Gun is the SAFE way to do all
home repair jobs that call for soldering
or brazing. Saves gas, saves time! Because it's automatic! Pull the trigger
and it lights. Release the trigger and
it shuts off, Always ready for action!

FOR IMMEDIATE DELIVERY
MAIL THIS QUICK-ACTION, MONEY-BACK COUPON

Century Aircraft Company, Gas Gun Division 5603 Century Boulevard, Los Angeles 43, California

Century Gas Gun, regulator, have, clamps and extension nazzle, \$36.80

Remittance attached—with the express understanding that if, after 10 days' trial, I am not thoroughly satisfied, I will return the equipment and get my

NAME _____

money back (if preferred, order COD, in that case, you pay shipping charges)

STREET.

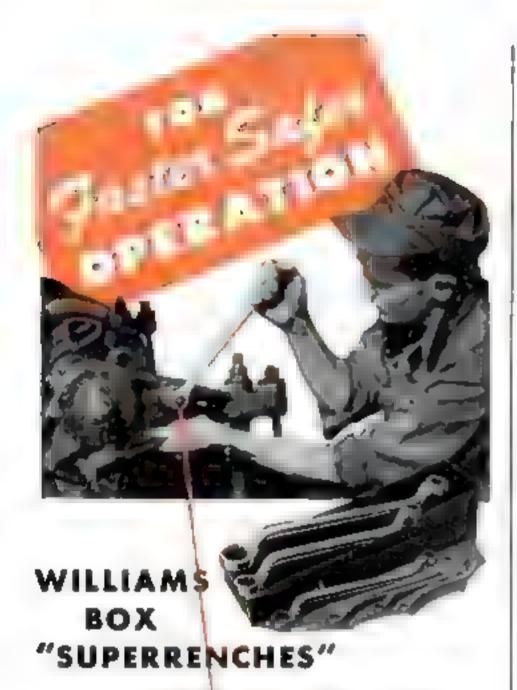
ZONE -

- STATE -

SEPTEMBER, 1945

Buy War Savings Boads and Stomps regularly.

229



with their thin head walls, permit fast and safe operation where clearances are limited. Offset handles clear obstructions that would otherwise bark knuckles and generally slow up the work. Their 12-point openings grip hex nuts on six sides ... preventing suppage and rounding of the nuts' corners. Complete rotation of hex nuts is possible with these wrenches where handle swing is limited to as little as 30°... less than pre-tenth of a full turn.

Williams Box "Superrenches" are made in a variety of popular patterns, including "Structural" and "Striking face" types. All are forged from tough chrome-alloy steel, heat-treated and fully guaranteed. Write Dept. S-9 for free Tool Data Sheets.

J. H. WILLIAMS & CO. BUFFALO 7. N. Y.



DROP FORGINGS AND DROP-FORGED TOOLS

(Continued from Page 80)

Radiations are known to affect living matter. Radium and X rays, for example, have been used in treating cancer. Hence, some of the biophysical effects of atomic explosions may be beneficial. But others may be gruesome. Persons far enough from an atomic explosion to escape instant death may be fatally injured internally; rescue workers hastening to the scene may also be injured, unless ways are found to decontaminate such areas. Popular Science Montbly's editors are confident, nevertheless, that scientists can learn to control this new source of power as they have controlled fire and electricity.

"We have been able to harness this tremendous energy in a small bomb," says Sir John Anderson, who supervised British atomic-bomb research as Chancellor of the Exchequer under Prime Minister Churchill. "That is for war. The first thing now is for the scientists to discover how it can be harnessed for the beneficial purposes of peace. That will be a long job."

As recently as June 1940, authorities estimated that it would take more than 191 years to make a single gram of concentrated uranium 238, the source of energy reported to have been used in the production of the annihilation bomb. How much has been produced is still a top secret, but this can be said: Much more than 191 years' work has been done in five years.

The combined efforts of the leaders in many scientific fields, from many nations, and facilities of many great American industries have made the employment of atomic energy to shorten this war possible. Those same efforts and facilities can contribute much more to the world.

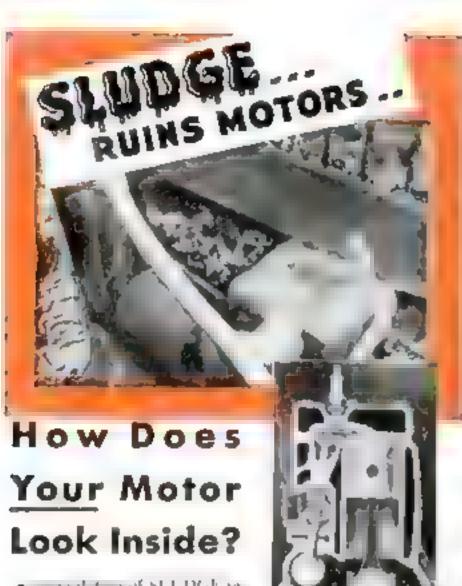
"A door has been opened in the world of science, and what may be on the other side is still to be seen," says Sir John Anderson. Popular Science Monthly hopes to describe that scene to its readers as rapidly as developments make this possible. Its editors hope, too, that readers of this magazine will be stimulated to contribute to the new era of science that dawned on August 6, 1945. By splitting the atom, man may have united the world.





Rugged Construction of the U.S. Navy's Grumman Hellcat Helped Bring This Pilot Back to Fight Again





A real to ref SI UDGH age policy were as a first serious as a first and get story, gas wearings, the pensive repair bills.

Car owners are getting wonderful results with LCBAID-T, a penetrating solvent for Deshidging and Motor Tune-up, for data ving gian, sludge and carbon binder, freeing piston rings and stocky valves, for pepping up motors.

A clean motor means longer motor life, Desludge and Tune-up your motor with LUBAID-T

You can get LUBAID-T at service stations and parages, if not obtainable write us. 12 os. size 60c. Quert \$1.00.



• Get rid of sludge. Keep your motor clean—give it new life and pep Use LU-BAID-T.



LUBAID CO.

Dept. 6 Milwaukee 1, Wis.

JOBBERS and DISTRIBUTORS WRITE





Vibro-Tool complete with \$750
20 ordinary engraving needles
Vibro-Tool plus \$1170
complete set of attachments . \$1170
We tak accept priority rated orders only Atlack check at N. O., or sent (.O.D.









main Court or

Carres Weed

Engroves Class

Sicus Cardinon

BURGESS BATTERY COMPANY

176 N. Walash Ave. Chicago 1, III

A HOT COMBINATION!

HEATAB FIRE TABLETS

There's both ng clee like this sensational COOK I succempact you an east with store and mission fact in your powhet or glave compactment of some star It as making how many wave people are using this lamous COOK I both induors and out.

Hundreds of uses for mechanics, has briefs repairments factories, shops, homes, and home workshops, t real for camping hunting, fishing Heat and focus — try or head — start tamp and preside here. Handrest portable heating method for homemakers, doctors dentists, chemists and others. Used extensively by all branches of atmed forces—— a "excit gair for friends and remirror in service — "costler" (OOMIT complete with hotplate and supply of H. Alice only \$1.00 at your leader— are a der area.

\$1.00 postpaid. In Canada \$1.55, No. (10.1) a. please.



Why Speed Nuts are FIRSTwith all five





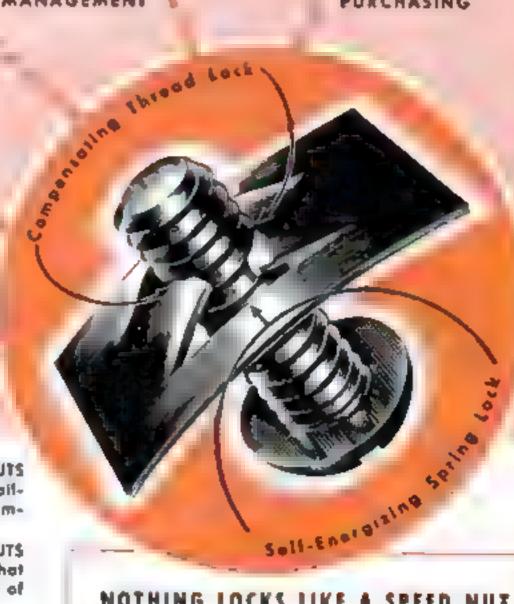


PURCHASING





TIME STUDY AND COSTS



FIRST with Engineering because SPEED NUTS simplify design problems and are either available, or can be produced to meet any assembly requirements.

FIRST with Management because SPEED NUTS are time-tested, vibration-proof fasteners that improve the quality, and prolong the life of the finished product.

FIRST with Purchasing because SPEED NUTS lower inventory costs, reduce stocking problems, and are DELIVERED on time Production and service facilities are unlimited.

FIRST with Production becouse SPEED NUTS eliminate extra handling of production parts, are applied faster and easier, and compensate for a wider range of commercial telerances. FIRST with Time Study and Cost because SPEED NUTS slash total net assembly costs to a fraction of other assembly methods.

Investigation will prove that SPEED NUTS should be YOUR first choice, too, Write for Information today.

NOTHING LOCKS LIKE A SPEED NUT

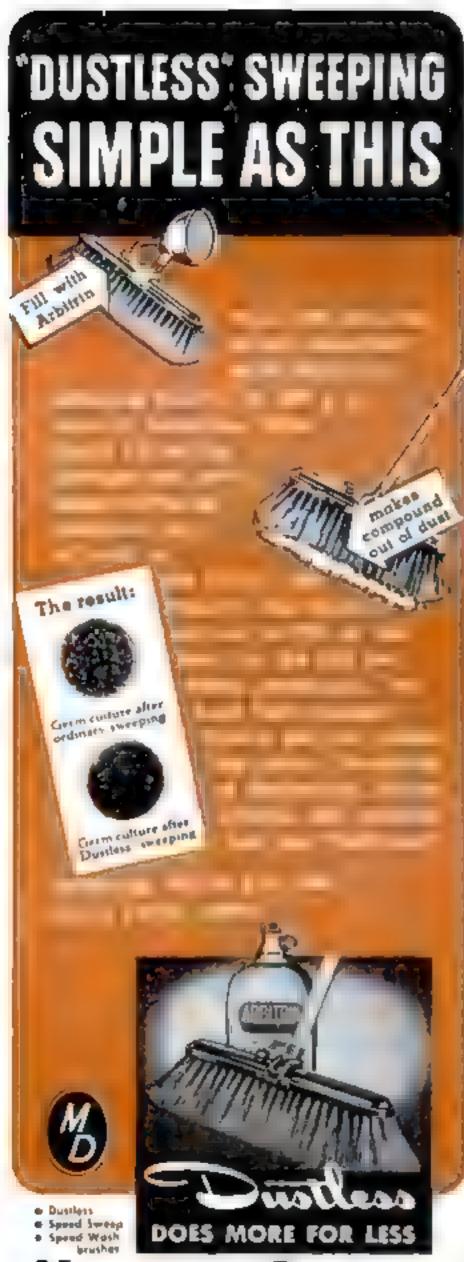
TWO distinct forces are exerted on the screw, as a SPEED NUT is tightened.

First, a compensating thread lock, as the two arched prongs move inward to lock against the root of the screw thread. These free-acting prongs compensate for screw thread tolerance variations

Second, a self-energizing spring lock, created by the compression of the arch in both the prongs and base. The combined forces of the thread lack and spring lock definitely prevent vibration loosening.

TINNERMAN PRODUCTS, INC. • 2022 Fulton Road, Cleveland 13, Ohio





MILWAUKEE DUSTLESS BRUSH COMPANY

528 N. 22nd Street - Milwaukee 3. Wisconsin

Gl's Fight in Armor

(Continued from page 77)

Improvement of all body armor, including that used by flyers, is going on all the time. Two standard vests for airmen, made of overlapping two-inch-square plates of Hadfield manganese steel in fabric pockets attached to a backing of nylon canvas, now are being produced. One of them, worn by bomber navigators, bombardiers, and gunners, weighs 17 1/2 pounds, and protects both the front and the back of the wearer's torso. The other, worn by pilots and copilots whose backs are protected by armor-plate seat backs, weighs 7% pounds and protects only the front of the body. Pilots and others who normally remain seated during flight wear groin armor which weighs 15 🐪 pounds and gives maximum protection to the abdomen and thighs. Other crew members wear either of two models of armor aprons, one of which weighs about seven pounds and the other about five pounds. The pieces making up the various protective combinstions are attached to one another by quickrelease fasteners which are connected by a rip cord. A single jerk frees the wearer.

One innovation now being tested in service is flyers' armor that combines an increased area of protection with an im-

portant decrease in weight.

Seventeenth-century military men who decided that improvements in firearms had made armor a useless and dangerous encumbrance must be stirring uneasily in their graves.



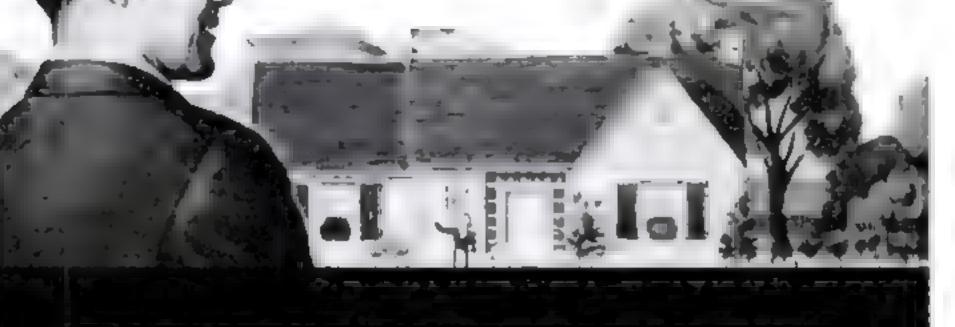
- last longer * give clean, uniform heat
 perfect flame control
- patented INNER-FLOW construction feeds oil evenly, prevents shrinking, stratching
- easy to install, adjust and remove

PERFECTION STOVE COMPANY
CLEVELAND 4, OHIO

HE DESERVES A LIFE THAT'S BRIGHTER.

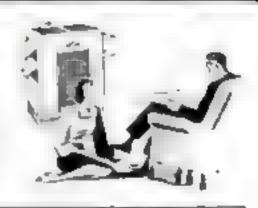
3 CHORES LIGHTER...

IT'S easy WITH PERFECTION!



1-SOMETHING TO LOOK FORWARD TO ..

Every room in the house warm and inviting in winter thanks to Perfection On Burning Heaters. And all the warmth without work or dirt' Dial control gives any degree of heat you want. Heat directing shutters send heat where you want it—keep floors warmer. Blower and humanities extend heat range and increase comfort.





2-WATCH HIS EYES SPARKLE ...

When he sees what a Perfection Oil Range can do to the kitchen! So bright and cheery—so clean and convenient, Ashes, dirt, soot and clutter—gone forever! "High Power" barners give any degree of heat you want, "Live Heat" oven assures better baking. Perfection in the kitchen means better living.

3-PLENTY OF HEAVENLY HOT WATER ...

On tap all the time for baths, housework and laundry—thanks to Perfection's modern Oil Burning Hot Water Heater, What a comfort that will be' Due to our work only limited quantities available at present

PERFECTION STOVE COMPANY . 7785-A Platt Ave., Claveland 4, O.

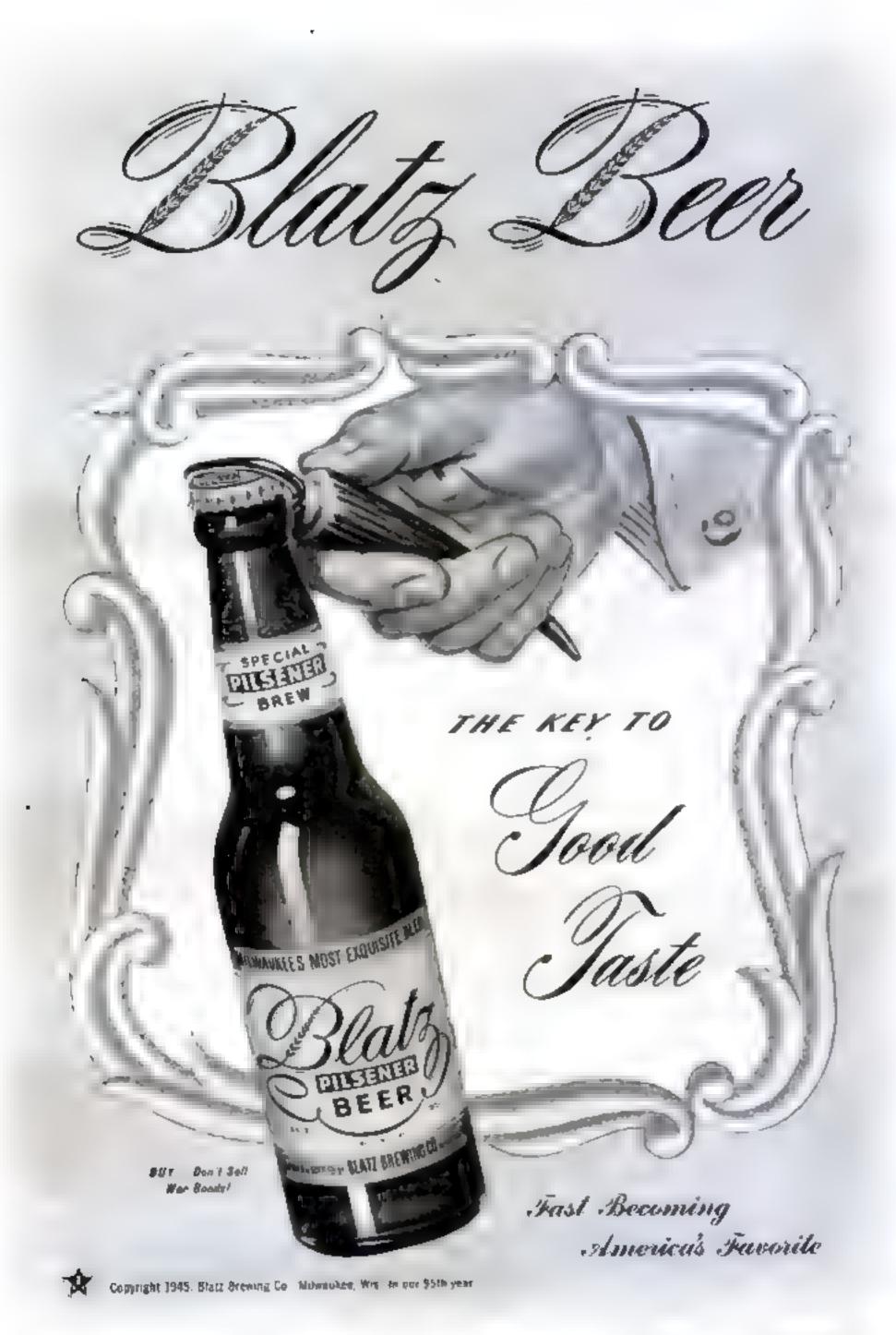
Buy War Bonds

The Mark of Quality





RANGES - HEATERS - HOT WATER HEATERS







Design engineers looking for peak efficiency and long life in fractional H.P. motors, will pick a QUIET motor—a BALLENTINE

MOTOR. Because only skilled craftsmanship, strict adherence to close tolerances, precision dynamic balance plus modern manufacturing methods and equipment can produce a truly QUIET motor.

In BALLENTINE MOTORS, the engineer and all these factors—as their west—combined with suitable mechanical and electrical design. Quies BALLENTINE MOTORS are available in ratings from 1/1000 to 1/6 H.P.—adapted to your specific application.

Write for descriptive bulletin.



BALLENTINE MOTORS

Manufactured by

RUSSELL ELECTRIC COMPANY

356 W. HURON STREET, CHICAGO 10, ILLINOIS

MLTO

CUSTOMBILT is a pipe for the affections...it is a treasure to handle and a friend to smake... Bench-made by stylists who never repeat themselves... No two ever alike ... Carved from the largest stummels of selected imported Bruyère, so as to give the cooler smake of a larger bowl... Lightweight and brokes-in the instant it is filled and affame.



Properillustrated, \$8.50. The CUSTOMBILT
Proper collection sucludes a wride range of
styles at \$5, \$7.50, \$8.50, \$10, \$12.50 and
up. All packaged in handroms gift boxes.
Only at Better Stores.

John Hudoon Maare, Inc., 663 Fifth Ave., N. Y. 22 Distributors also of Sportsman Pipe Musture, Societi Fine English Pipes and Sportsman Toiletries for Men.

Kickless Cannon

(Continued from page 87)

The 75, too, can be loaded and fired by two men, but in many situations the heavier ammunition—each round weighs 14.7 pounds—would make the assignment of additional ammunition carriers necessary.

The 57 can be fired from the standing, sitting, and prone positions, or it can be rested on the standard .30 caliber machine-gun tripod. The 75 normally is fired from a tripod, but in an emergency can be fired from a mound of earth

Three kinds of ammunition are being used: high-explosive, for use against personnel, unarmored vehicles, and such targets as light field defenses; high-explosive antitank shells for use against tanks, pillboxes, and the like; and white phosphorus, good both for smoke and against personnel. The high-explosive projectiles have very sensitive fuses. They will detonate on touching foliage. That makes the recoilless gun an effective weapon against tree-sitting snipers.

The idea of the recoiless gun was conceived by, and the weapon developed under the direction of, the Small Arms Development Division of Army Ordnance's Research and Development Service. Engineering assistance was given by a number of industrial concerns.

The weapon is so new that a doctrine for its tactical use has not yet been formulated. The organization of recoilless-rifle infantry platoons, with a firepower equal to, or even greater than, a field-artillery battery is possible. It may be that the application of the principle will have a profound effect on the development of all artillery weapons—for sircraft, antiaircraft, and naval as well as field-artillery fire.

The recoilless gun is not an unmixed blessing to men at war. While its muzzle velocity
is far above that of the bazooka's rocket
projectile, it is half or less that of an ordinary fieldpiece built to take the backward
kick of propellent gases. That means a reduction in range and effectiveness in the
delivery of explosives on a target.

But as a way of boosting the firepower of the infantry, its success has been unquestioned. One excited Jap officer on Okinawa, practically catapulted into the arms of his enemies by gunfire, jabbered away at the interpreter, demanding apparently that he be shown something. The interpreter and the intelligence officer finally gathered what he wanted. He was interested in only one thing the new American artillery that popped up anywhere and everywhere on the battlefield and broke all the rules of heavygun mobility.—DEVON FRANCIS.



A MAN'S BEST FRIEND

is his "travelo" Knit Jacket

by Revere

"travelo's" been keeping millions warm ever since you were knee-high to an icicle! Wear a "travelo" Knit Jacket or Vest indoors and outdoors. The old favorite style is still smart as ever. 100% virgin wool . . . they hold their shape.

Since



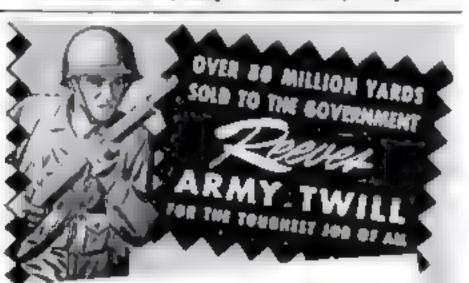
1014

ш

m

REVERS KNITTING MILLS, INC.

Makers of Revore Sportsweez-Molden, Mass. * 302 5th Ave., N.Y. 833 Merchandise Mart, Chicago * 608 So. Hill St., Las Angelas



Under actual battle conditions, Recoest Army Twill has exceeded Government specifications. It has great tensile strength excesses tearing, snagging and scuffing. Its dyes are fast to sun, water and perspiration. Sanfarized Shrunk', it toilors spiration. Sanfarized Shrunk', it toilors smartly, holds its lines. You will be able to get this outstanding labric in a wide variety of colors in post-war work clothing. Demand it after Victory!

*Residual Shrinkage less than 1%

REEVES BROTHERS, INC. 54 Worth Street, New York 13, N. Y.

RERFECA

There are two kinds of sighs in a pipe bowi... One is a sigh for something better and the other is a sigh of contentment... Otherwise known as Sportsman Pipe Mixture, a choice blend of the finest aged domestic and imported tobacces... Full-badied but mild with the tranquit bauquet of harmonleus proportions.

SIMMINATURE
The Champion of Blends



John Hudson Moore, for., 663 Fifth Ave., N. Y. 22 Distributors (also of Custombilt Pipes . . . Societé Fine English Pipes and Sportsmon Toiletries for Men





The original hand tool and today's finest for precision work on any metal, alloy, plastic, wood, horn, bone, glass, etc. Fits your hand comfortably, perfectly balanced, weighs only 12 ounces—it's the "non fatiguing" tool. And Handee's usefulness is

> as extensive as the number of quick and easy-to-change accessories you own...choose from more than 300 in the Chicago line. Operates on AC or DC current at 25,000 r.p.m. With 7 accessories, postpaid \$18.50

Write for free new 44-page cotalog CHICAGO WHEEL & MFG. CO. 1101 W. Menroe St. Deel Po. Ehicage 7, 111.



Kolk-Kord, the original non-hardening caulking compound in soft, rope-like form, enables you to effectively seal window and door frames, cracks and, crevious, inside or out.

Just prem Kalk-Kord into the crack or hole with fingers; no tools required Kalk-Kord will not hardso, check, or crack. It make tightly and stays tight,

Don't wait till cold weather—use Kalk-Kord to seal out winter's cold right now. It cuts heating bills; saves cleaning of walls and drapes due to soot and dust. Use it also to plug and seal holes in wood or plaster Kalk-Kord is waterproof and can be painted over at once,

Packed in convenient rolls, ready for use—neat and clean to work with, Anyone — and everyone — can use Kalk-Kord, Get a box today.

Boy Kalli-Kord at your sourset Sours-Booksek rainif store, or arder by mail from Sours



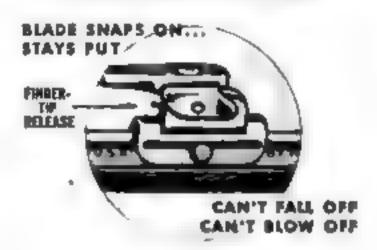


Joe's right! The right gun makes a difference! Ever since STEVENS pioneered the development of repeating shotguns nearly 40 years ago, STEVENS "pumps" have been famous for sweet handling, dependability and value. J. STEVENS ARMS COMPANY, Chicopon Folis, Moss, Division of Savage Arms Corporation, Manufacturer of STEVENS and SPRINGFIELD Rifles and Shotguns,



ANCO RAIN-MASTER

"Dead - Locker"
WINDSHIELD WIPER



(A war-born invention—by ANCO—first) for military aircraft—now for your car.)

DON'T SHOOT YOUR

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car... in stormy weather... with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them. But he forgets to remind you? Too busy? It's the war! You can't shoot him for that.



After all, it's your car to protect. So youremind him. Get RAIN-MASTERS . . . patented features . . . original equipment on many makes of high grade peace-time cars . . . used on our fighting tanks and trucks and ships and bombers too . . . because ANCO RAIN-MASTERS clean quicker, clean cleaner . . . last longer. May save you a costly smashup.

Ask for RAIN-MASTER Windshield Wiper Arms and Blades next time you buy gas,

THE ANDERSON COMPANY

Established 1918

GARY, INDIANA



Pill, new miracle figure insulation, moisture-proofs the ignition system on motor care, motorboats, planes, it makes betteries last longer by fighting corrosion and top-surface aborts. Pill scale worn insulation, helps start rain-stalled angines.

Pill flows easily .. penetrates. . dries plable . endures. Pill is so effective that it's used on engines of Army and Navy vehicles during amphibious operations. Use Pill on any gas-oline or electric motor . . . industrial and farm machinery . . . home appliances.

1 TREATMENT FOR 6-MONTH SAFETY!



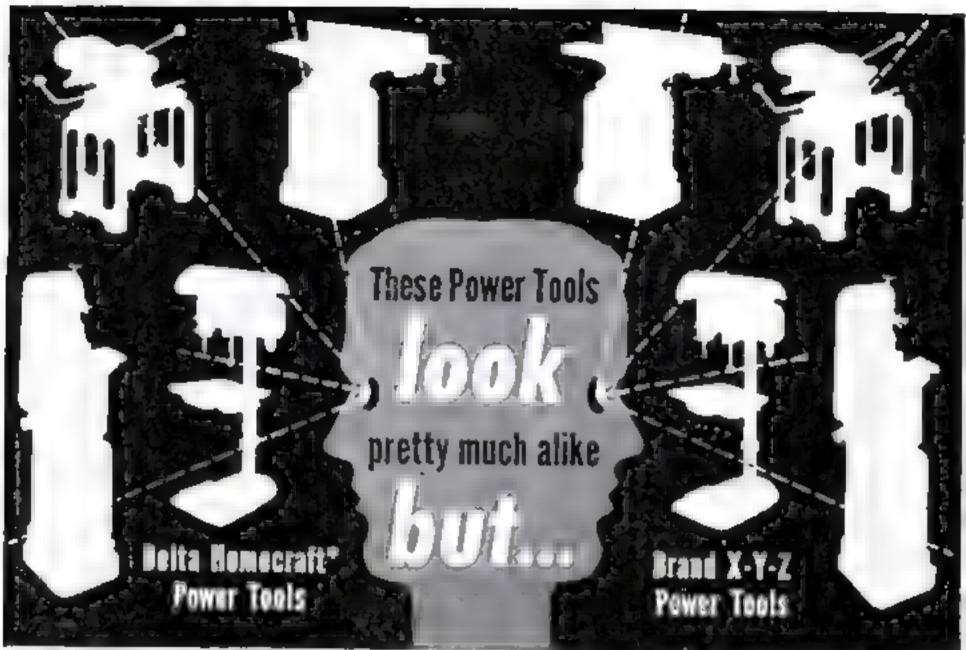


STOKER EMPTIES OWN ASH!

A remarkable stoker already used by thousands of home owners—fits into any furnace or boiler. Manufactured since 1934. So automatic it takes the coal from your present coal bin through a pipe to the furnace, going around corners if necessary. Keeps house at even temperature, empties its own ash in sealed containers, no coal to shovel, no clinkers to dig, only bituminous stoker of its kind on the market. Send for full information NOW!

POCAHONTAS FUEL COMPANY INCORPORATED
341 EAST 131+1 STREET - CLEVELAND 8, ONIO





Advanced Engineering of the Delta tools helps you get greater operating satisfaction



The line of Delte Tools, includes Delta Scroll Sow, Delta Band Sow, Delta Lathe, Circular Sow, Delta Lathe, Delta Drill Press, Delta Jointer, Delta Grinder, Delta Shaper.

fear out coupen and mail today for 36 page Delta book containing compute piers and instructions for making desent of good-looking pieces of furniture — dest, book tases cabinets, cupboards, etc Enclose coin, pasias note, or maney order with coupen at right.

Trade Mark Res. L. 3. Pat. Dec.

Delta's industrial-type construction features help assure you of accuracy, dependability, safety, economy:

Labricated-for-life Bell Bearings. You don't have so worry about ciling these hearings — they're labricated for life when they leave the factory. And they are double-scaled against harmful dust, to assure you of longer bearing life.

Pre-loaded Bearings. This is the result of an extra manufacturing operation that reduces the "play" in the bearings, to help you enjoy long-time operating efficiency and accuracy.

Precision-bored Bearing Seats. These bearing sents help keep all parts lined up properly, so that you have greater assurance of producing finished pieces exactly according to dimensions.

Precision-ground Shofts. These are shafts built to run without any "wobbling" which might throw off your measurements.

Dynamically-balanced Pulleys. The pulleys which transmit the power from your motor to your power tool are balanced to help eliminate annoying, damaging vibration.

In selecting any power tool, it pays to choose Delta, to get builtin values like these.

So to enjoy a full measure of the pride and pleasure that arise from the deep satisfaction of using quality tools, include famous Delta Homecraft Power Tools in your woodworking hobby plans.

Right now, save for your happiness — and earn the right to enjoy it — by buying and holding War Boods.

THE ASS

THE DE	LTA MAT	NUFACT	URING I	co	• 4
					Wisconsle
1 em	enclosi	ng 25e	in full	Paye	ent for
copy .	of Delto'	s book,	"Fyrail	ure D	osigns."

Home	
Address	
CI.	

Get Ready for Anti-Freeze



Clean Rust Out of Your Radiator

Now's the time to rid your cooling system of rust, scale and grease-before the cold weather sets in and you have to add antifreeze. Don't wait for the big rush-do the job now Du Pont's Cleanser actually dissolves rustcleans thoroughly without harming the hose, packing or metal paris.

DU PONT Cooling System Cleanser





THEN KEEP RUST OUT

After cleaning out the cooling system, you can stop more rust forming-and prevent acid, too -hy pouring in a can of

DU PONT

Acid and Rust INHIBITOR

PREVENT RADIATOR LEAKS

Make the cooling system of your car LEAK-PROOF, Don't let your precious anti freeze seep away this winter You can stop the leaks, and keep them sealed, by pouring into the radiator a bottle of





SETTLE THINGS FOR SETTLE LIVING . T. SIRGUAGO CHEMISTOY

Buy War Savings floods and Stomps regularly.

ANGLE VISES

For MILLING—DRILLING—GRINDING FITTING—FILING

Salva Difficult Angle Jobs

Quick, accurate setups at any angle. End make-shift methods--ume loss-rejechome workshop. Accurately machined and gradu-ated Once set it stays locked, laws hardened steel plan or gruoved, Sixes

tool room, machine stop, school home says of rejair shop, r martined. Best semi-Adjusting screw of



No. 250 MILLING ATTACHMENT VISE

A most pecchaary fixture for attail shops and even emergency work in large obes. Adaptable for Arms Bond Adaptable for Arms Bond Adaptable for Arms Bond Adaptable for Island of a mile rate line graduated vertical feed serew and 360 degree graduation for vertical feed serew and 360 degree graduation for vertical angle adjustments, hasty mounted on cross slide angle adjustments, hasty mounted on cross slide and held by one T and boll Equipped with PALM all N VISE 313 James opening full 213 Vice has one plate and one grooved jaw for holding round pieces.

MAKES MILLING OPERATIONS POSSIBLE ON ANY LATHE

Width Denth Opening
Jaw Jaw Jew Height Frice
37g 17 10" 219" 1019" 024 75
48 year Dealer can't supply—order
direct!

Wette for Circular No. 347

CHICAGO TOOL AND ENGINEERING BASS South Chicago Avenue Chirago 17 III.

Socieg 8-29 "Super-Jertress"

Greatest of All Bombers



Temi-solid Line-Controlled. \$ 1.00

TOOMDOR Searce, Gilder, C-D Eit E-SOLG \$1.00

if your dealer dan't supply you, after dipoe, order di-rect, including 20c entra for packing a poet-

BLACK WIDOW C-D Kit T-155 \$1.50 EVELAND MODEL & SUPPLY 4508E86 Lorain Ave., Cloveland 2, Ohio, U. S. A.



Cracks and nicks can be filled with PLASTIC WOOD, then refinished like new. At Paint.

Hardware, 10c Stores





under all kinds of conditions!"

Pvt. Jim O'H., writes from the Pacific area: "Just received the Enthusiast Magazine. It brings back memories of the days we all enjoyed so we'l. Since coming overseas, I've seen how Hartey-Davidsons stand up under all kinds of impossible conditions. I've ridden your military model 45 through many miles of swamp and jungle — have seen them under enemy shell fire and not once have they failed to complete their missions. You can be sure that when the postwar Harley-Davidsons roll off the line I'll be first in line."

Thanks, Pvt. Jim O'H. — we know all you fellows are looking forward to the days when you can again enjoy race meets, hill-climbs, endurance runs and other fun-packed motorcycling events. Like you, thousands of motorcycle fans have a new Harley Davidson on their "want first" list.



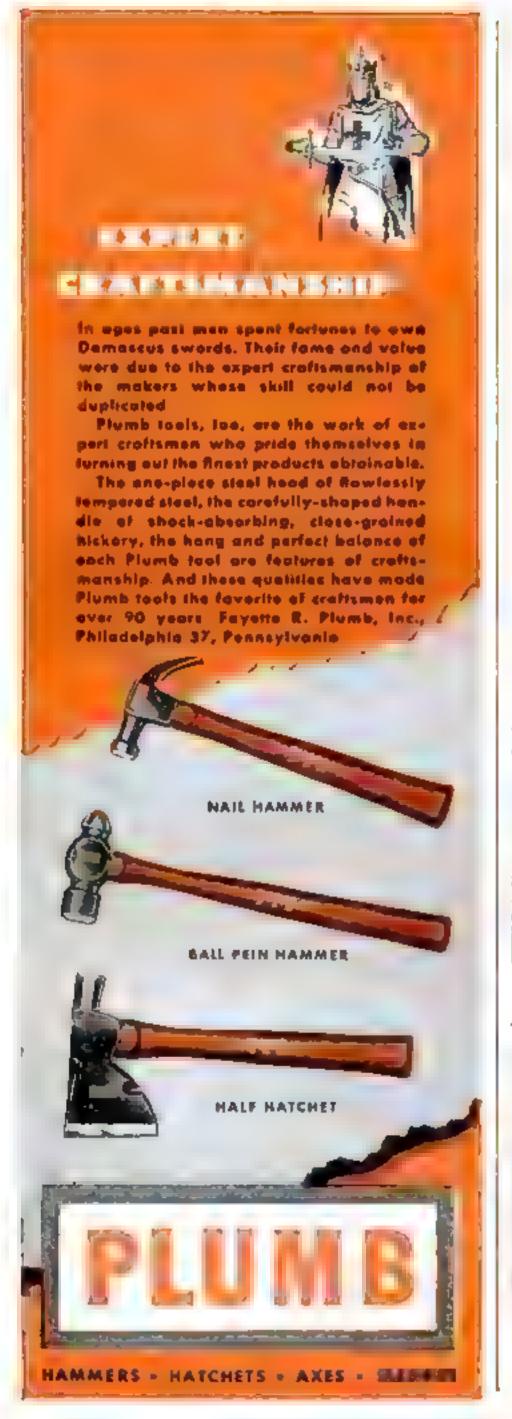
HARLEY-DAVIDSON MOTOR CO. Department PS, Milwankee 1, Wisconsin

Please send at once free copy of 24-page "Enthusiast" Magazine, filled with motorcycle action pictures and thrilling stories.

Name

Address

Try_____ State_____



PICTURE OF AN OLD BRUSH



This was a discarded brush, stiff with paint used in 1958. Dic-A-Doo Paint Brush Bath has reconditioned it ... restored to the "100 % brustle," the onesial flexibility and spring.

A good brush deserbes good care and the present "War Emergency" brush requires it. Keep them clean the safe way with

DIC-A-DOO

Paint Brush Bath

Sold at Hardware, Paint, Grocery and 5-&-10# stores.

Pasent Cereals Company Geneva, N. Y.

59-109 size



After War
THE WORLD'S SAFEST ELECTRIC JIG
SAWS will again carry the name:

SYNCRO DEVICES, INC.
FERNDALE 20, MICHIGAN

REPAIR FURNITURE WITH HIDE GLUE like the best furniture factories use

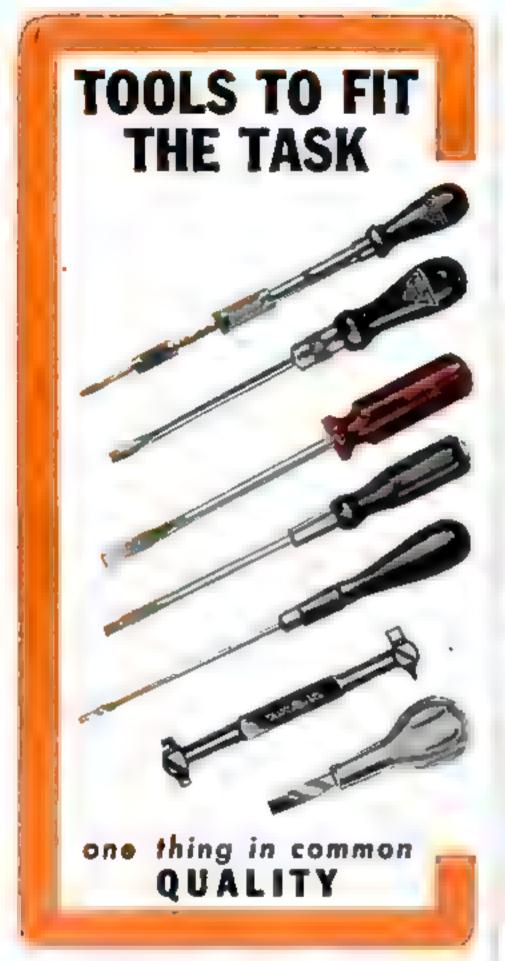
Liquid, ready to use without mixing or heating. No chilled joints.

FRANKLIN Liquidylide GLUE

F YOUR HARDWARE DEALER CANNOT SUPPLY YOU send 30c for 1/4-pint to The Franklin Gles Co., Columbus 3, Ohio,







From the powerful, smooth-acting spiral ratchet models to delicate jeweler's sizes, there's a Millers Falls Screw Driver to fit every job. Each is the best for the task; each a tested, balanced, long-lived tool which you will keep and use with pride.

Today, more and more Millers Falls quality tools are becoming available. Con-

sult your dealer.



Buy War Savings Bonds and Stomes regularly.



Shinola Shoe Polish really does a job on scarred-up furniture!

• If you've ever tried Shinola for covering up nicks or scratches on furniture, you know what a really professional-looking job it does. You apply it as you would any wax. It's simple to use, and inexpensive, too. Whether the furniture you want to touch up or refinish is old or new-cherry, maple, wainel, mahagany, or pine—there's a Shinola colored was to do the job.

Shinata Waxes are swall for preserving lineteum... for finishing airplane and ship models, too. Keep these extra uses in mind when you're buying Shinala Shoe Falishes.

SHINOLA-10¢

IN ALL COLORS

TAN (RUSSET) . BROWN OX-BLOOD . BLACK



(In Cassia It's 2 in 1)

HARD TO GET
RADIO PARTS

AVAILABLE AT
DIO PARTS CO.

W. RANDOLPH ST., CHICAGO 4, ILL.



THE NEON GLOW

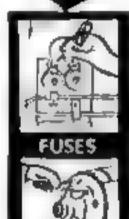
INSTANTLY in electric circuits, fuses, cut-outs, motors, rodies, appliances. Tests everything alectrical from 100 to 550 volts. Indicates hat ar grounded ways, Tells AC from DC Far su-

AC from DC For seperior to ordinary clomy test both.

PUTS "FINGER" ON THE TROUBLE SPOT -- QUICKLY

Bavon droctom time. Indispensable in shap to home. Has parented safety features. Yest sector size with clip. Lifetime guaristre, List \$1.50, Perchane through regnite electrical dealers.

L.S. BRACH MFG. CORP., 55 Bickerson St. ... Newark, N.A.



MOTORS



OUTLETS



for Every Outdoor Trip "Tomorrow"

After the war, this new Coleman "Pocket" Stove will be the grandest little sport stove outdoor-loving Americans ever touched a match to ... it will be the perfect portable quick-cooking pal for hunters, fishermen, picnickers, vacationers. Thousands of uses around the home.

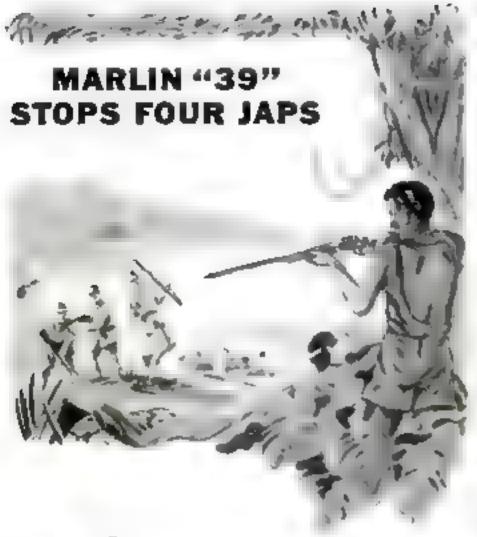
Burns Any Kind of Gasoline — White or Leaded - Ready in minutes for cooking, heating drinks, purifying water. Compact — its telescoping case provides two handy cooking utensils. Easy to carry as a quart size can of food. Only 8½ inches high; 4½ inches in diameter. Expertly designed and quality built for years of trouble-free service. Watch for

the Coleman "Pocket" Stove.

You'll want onel

FREE BOOK-Write for dramatic picture story of the Coleman "Pocket" Stove in use on the fighting fronts.





LATEST REPORT on the all-around utility of Marlin's famous lever action .22 cal. rifle comes from Leyte, scene of the first bloody battle in the reconquest of the Philippines.

it is also a story of courageous Filipino resistance to the Japanese invader.

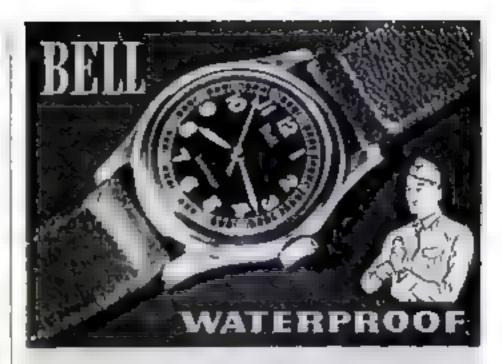
Liberated from a Jap prison camp, an army man was assigned to Leyte. According to his letter to Marlin, he was one day invited to visit a small bamboo hut by a Filtpino boy who looked to be about sixteen years old. The lad proudly took a rusty Marlin '39' off the wall, and described how he had killed four Japs with it up in the mountains of Leyte.

His old Marlin lever action .22 had been left behind by a couple of mining engineers. He had buried it in the dirt to keep it hidden from the Japs, which accounted for its rusty condition. Despite the abuse this Markn '39' had taken, the action functioned perfectly upon examination.

THE MARLIN FIREARMS CO.

NEW HAVEN, CONN.

Straight-Shooting Guns Since 1870



Waterproof, shockproof, unti-magnetic, radium dial and hands, unbroakable crystal, precision tested, sweep second hand.

No BE 121 \$39,75 15 jawels, slainiets steel back

No. 85 212 \$42.50 17 jewe s, stoinless steel back

No BE 378 SELF W NOING \$59.75 awa 1 sto n ess steel cose

Prices Include Mil Federal Excise Taxon Pastage Propost. Mail Orders Promptly Filled Write for Free Illustrated Backlet BE

WATCH COMPANY

Time and Life Bidg., Rackelatter Centur New York 20 H Y



HUNTER'S COMPASS

Metal, Jeweled

Engineers All Metal Army Type Hand-Sighting

LEVELS

\$1.50



PUBLIC SPORT SHOPS

13 S. Toth St., Phila. 2, Pa.

No COD's

TAPE WORMS ROUND WORMS (Ascarids)

HOOK WORMS WHIP WORMS



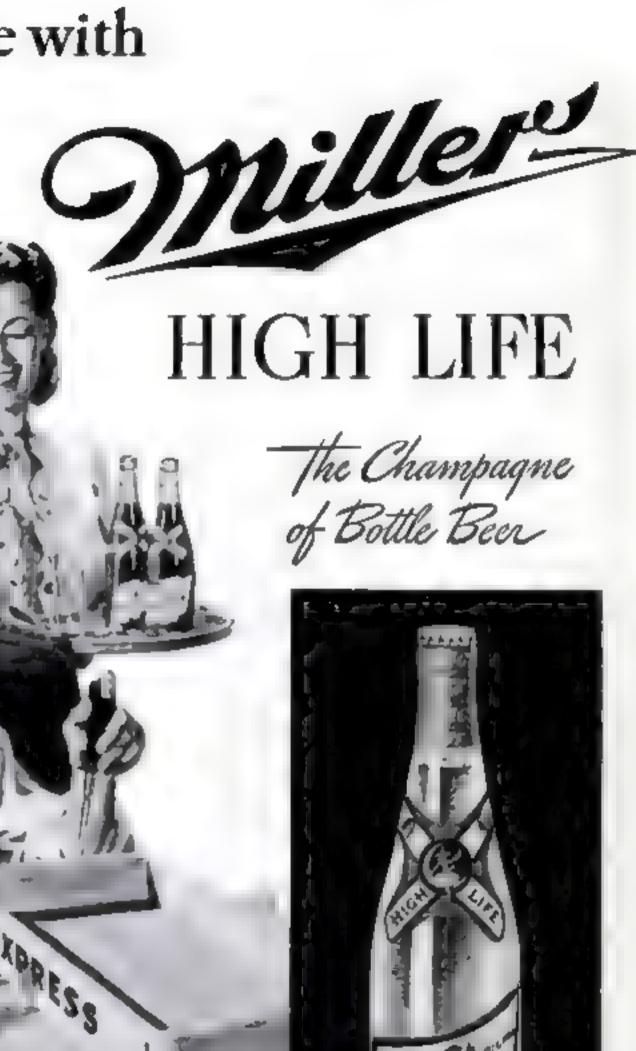
...you can free your dog of all these worms

with

COMBINATION TREATMENT

Used by leading terestees. At leading pet, drug, department stores, 50t a partage (double size, 75c). Parted two ways, for poppies, for dage.

Enjoy Life with



MILLER BREWING COMPANY - MILWAUKEE, WISCONSIN



A RARE BARGAIN IN PIPE TOBACCO

BARGAIN BARRE

Surplus from compt-inded private formulae—\$3, \$4 and \$5 a lb. mintures—saved in oak barrels, then aged, seasoned, counter-blended and aromatized—are now available to you at only \$1.00 per 1/2 lb Here is a deluxe quality mixture of delicious flavor—guaranteed to give you a new thrill in pipesmoking Will never clay or jade the paints. Is always good—always different!

SMOKE IT AT OUR RISK!

Order a trial 1/- Ib container of BARGAIN BARREL for \$1
Smoke a law pipefuls. Sever this delightful mixture that always pleases. If you are not fully satisfied, you can return package for complete refund, Order TODAY!

Sidney P. Ram, Tobacconist for Connoissours 59 W. Monroe St., Dapt. DK-612, Chicago 3, Ili.



ARMSTRONG TOOL HOLDERS

mabled American Industry to change to war production "over night" For they are the permanent, multi-purpose tools used by 96% of the mach ne shops and look rooms, on lather, planers and shapers—the tools used to make dies and lies, to build production machines. They are the tools you will want for your own shop after the war—ARM-BIRONO TOOL HOLDERS for industry, ACE Tool Holders for boths work above.



ARMSTRONG BROS, TOOL CO.

"The Tool Helder People"
1100. Francisco has Chiesgo 12, U.S. S







\$200 Price complete at hardware or send remittance direct to

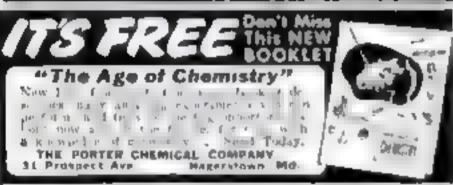
NORK WIGGLER

for FAST and Accurate Set-Ups

Wiggler body hardened alloy alee! Ball shaft enables you to indicate accurately from took makers buttons, holes, ground surfaces, gauge blocks, etc. Needle-Point shaft is for finding centers and truing to layout lines. Bent shaft holds any type indicator and allows it to be positioned on any circle to 6-inch dia. The only Universal Wiggler of its kind.

MORK PRODUCTS COMPANY Dept. 236, 5827 S. Main St. Los Angeles I, Calif.





WANTED!

No, we don't want "0132057745"! But we re mighty anxious to lay our hands on that old musical sustrument you re not using. We'll pay the highest prices in America for any of the following band instruments regardless of tryle, age or make:



TRUMPET • CORNET • TROMBONE • ACCORDION ALTO OR TENOR SAXOPHONE • FRENCH HORN BOEHM SYSTEM CLARINET • MELLOPHONE

Send us your instrument for appraisal. If our offer is acceptable to you, you'll get spot cash plus shipping cost by return mail. If not we return it and reimburse you for shipping expense.



Suite 3406, 105 W. Adams St., Chicago 3, 111.



GOOD HAMMER

Of all the Stanley Tools you choose for your postwar home workshop, none will give you greater satisfaction than a Stanley Nail Hammer.

The heads are drop forged, heat-treated and oil quenched to eliminate strains and insure toughness throughout the steel structure. The "Evertite" handles are of sound, young, straight hickory, thoroughly seasoned and oil treated to prevent shrinking. They will not loosen and come off. There will be numerous, well-balanced models for your every need.

Let Experts Help Select Your Tools

Stanley has a free booklet for you, "The Joy of Accomplishment." Crammed full of helpful suggestions for the home craftsman, it contains: a primary list of tools and a special list of tools to be added as needed. You'll also find the big Stanley textbook: "How to Work with Tools and Wood," mighty useful. It's yours for only \$1.00. Mail the coupon today.



STANLEY

THE TOOL BOX

MAIL NOW

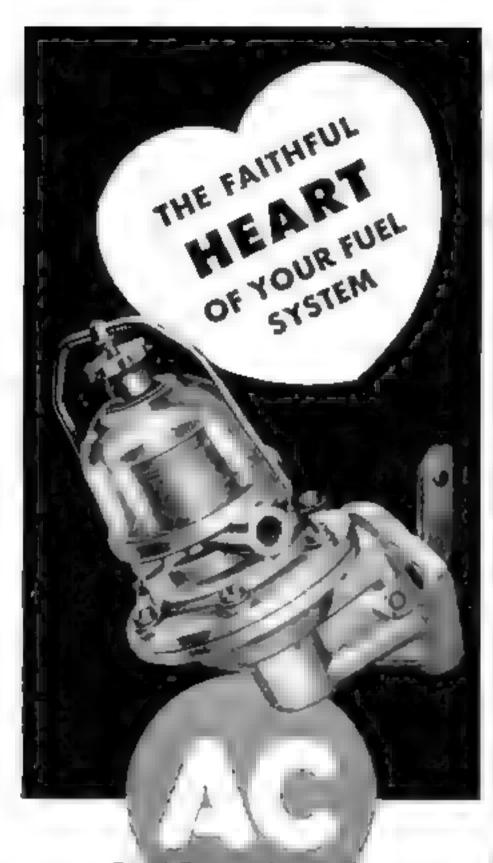


STANLEY TOOLS, 295 Elm 21., New Britsle, Cons.

Please send by return mail -

- The FREE booklett "The Joy of Accomplishment."
- I 188-page book: "How to Work with Tools and Wood." \$1.00 enclosed.

City	State		
Address.	8001 811111	MLIL	
Name.			_



FUEL PUMPS

Pulsing steadily, hundreds of times a mile, your AC fuel Pump is the strong, reliable heart of your fuel system. It has given you long, faithful service because of its inbuilt quality and scientific design.

You can prolong that faithful service indefinitely, if you insist upon an AC when you replace your present pump with a

new or rebuilt one.

BUY WAR BONDS . BRING VICTORY QUICKER

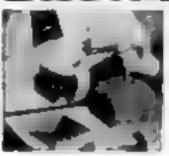


INEXPENSIVE

Gentine Service Tool Chests give more years of shitefactory service for lower annual cost. Free cals of for Machinists and Tuolmakers.

945 Columbia 84. Dayton 7, Ohio

Sand Casting—Forging—Heat Treating—Case Hardening
BRONZE FOUNDRY

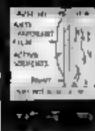


is again available in limited quantity without priority Orders filled in acquence as received INVENTORS-SCHOOLS-CRAPTSMEN use FOUNDRYETTE (or making custings quickly for new inventions, for instruction and general purpose Order now for early delivery. Three sites are available capable of making bronse castings of 115 3, and 8 pounds weight, aluminum, hyperbrane its. \$17 50, \$24.00. \$14.50, \$15.00. \$15.0

lex 6022, Dept. 3-58 Kansas City, Me.



REMOVES ALL FINISHES







NO BENZOL-ACID -CAUSTIC-ALKALI-

New type semi-paste remover guiddy lifts off parts, enamel, varnish, shellar, lacquer, bakelite and other synthetic resin finishes. (Removes emulsified resin water points, too.] Stays wet langer -stays put an upright or overhead surfaces — strips dean, quide. One coal usually enough (apply with brush or spray). Contoins no benzol, acid, coustic, alkali, or wax — harmless to hands, bristles, surface stripped. All sizes (pint 65c) at point and hardware stores.

FREE CIRCULAR

"How to Remove Ponts, Vor. arshes, Lacquers, etc." Also describes other Savagran Producis: Heavy Duty Cleaner, Crack Filter, Wood Putty, Remover & Bloocher (renews floors). Foint Brush Cleaner. Coldinum Soupless Soup Powder.



POSTON 19, MASS



IN EVERY WELL-EOUIPPED HOME WORKSHOP



COLLECT U. S. ARMY Shoulder Patches

Pascinating hobby Patches 20c to 50c each Complete set of 250 for 850 00 Official patches available for every major Army and Air Corps unit Bend \$1 for sample assortment of patches and liberrated patch catalogue. Orders from Canada-add 20%

SPRINGER'S

270 Sen Francisco St.,

EL PASO, TEX.



ARC-WELDER

For Light or Heavy Work

Owld Ma rewinding necessary that cuits
taken from old and generators

Works on I In or 220 A C. Has 20 deferred the sele. Complete plans and BIG Cuts on 35:

First Mfs., 2323 taken Side, Missespells, Non.





Seal your home against drafts and cold, stop expensive heat leaks! Keeps out dust and dirt. Just press MORTITE pliable plastic tape around windows. doors, baseboards, etc. It's easy! It's suret

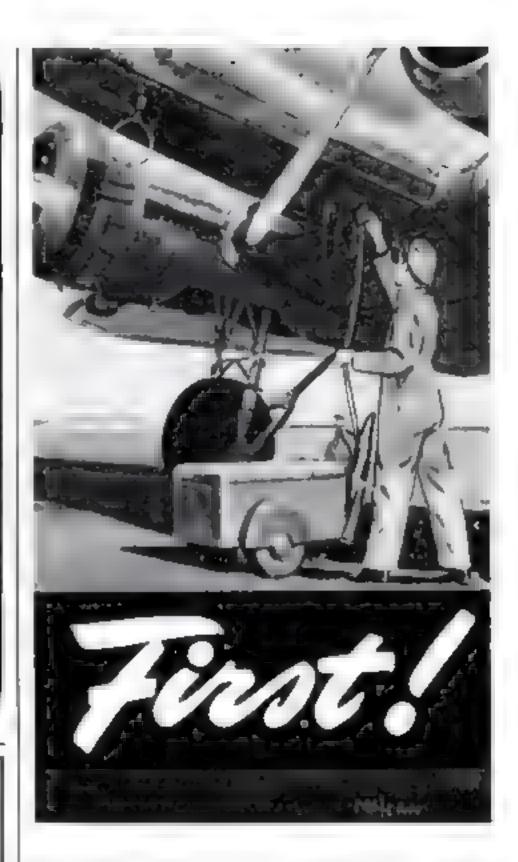
A roll covers about 80 ft., enough for 5 windows .

At hawe, point, dept. stores and lumberyards. PREE MORTITE J. W. MORTELL CO. CIRCULAR 534 Burch St., Kankakee, Ill.









BURGESS WINS IN NATION-WIDE POLLI

Where electronic experts and engineers use dry batteries (as in Radio Compass Test Unit above) their choice is "BURGESS 2 out of 31" When you need betteries for Flashlights, Radio, Hearing Aid, Ignition, Telephonechoose the brand that experts prefer—BUY BURGESS!

BURGESS BATTERY COMPANY, FREEPORT, ILLINOIS.





BATTERIES... Accept no other

Typical of satisfied users of Winchester batteries everywhere, one says "I am enclosing three Winchester batteries—your unit cell #1511 for your inspection. They have distinguished themselves almost beyond belief. I have used them almost continuously for approximately 13 months in the flash synchronizer of my speed graphic camera. Usually batteries only last one month or two at the most but these Winchester batteries, tested regularly every week, seemed to build back up and keep going."

Thousands of other users of Winchester batteries have experienced the inherent high quality and satisfaction of these batteries. Your dealer has them now or soon will have. Tell him you want Winchester batteries. Winchester Repeating Arms Co., New Haven, Conn., Division of Olin Industries, Inc.

WINCHESTER



For Lang Lanting bullet- fast LIGHT



PROTECT YOUR WATCH

A watch with a broken crystal is useless. Go to any jeweler—ask him for a G-S FLEXO CRYSTAL 100% BREAKPROOF, Fitted while you wait. Any size. Any shape. Guaranteed. GERMANOW-SIMON MACHINE COMPANY, Rechaster, N.Y.

FREE!! HOBBY CATALOG

Over 1000 items - Over 300 Photos

Our new 40 page catalog is the "bible" of wide-awake modelers. Hundreds of models to choose from! Planes, engines, boats, jeeps, tanks, gliders, supplies sto Bend for yours today!

AMERICA'S HODBY CENTER

Dept. 595, 40 E. 21 St.

N. Y. 10, N. Y.

PLASTICS

Plexigles, Lucite, Bakelite, Lumerith, Ethnool, Colless, Acetate now

available in sheets, reds, tubes and strips. If no assurtment of sizes. He priority required. Coments, dyes and other plastics supplies, teel. Send 10c lodgy for complete lists!

CARMEN-BRONSON CO., Dept. 9-A

165 E. Third 51

Mt Vernon, N. Y



FTITTY AT ROME for PERSONAL SUCCESS and LARGER EARNINGS 36 years expect instruction - over 108 000 students ento led LL S begree awarded Alitests furnished Easy payments Send for FREE BOOK. "Law and Essecutive Guidance

AMERICAN EXTENSION SCHOOL OF LAW Dupt. 57-8, 648 N. Michigan Ave., Chicago I L. III,

DRILL-INDEX A compact container for indexing and fiving twist drills Disminator search Made entirely of steel in nice access Armitable on printing to excential users. See your dealer or write to

AUGT MFG. CO. 438 Feat Schultz Blag Bt. Paul 1, Minn.

120 8 MILES & PER & GALLON

n to said der nem is he a said follen nem is he a said fellen nem is he a said of bible persons. En yet person for an he sed, er hi meres reason for a MPRI Serviced prepart comple with 4 cy.

2 of more and at a homen a got heavy du yet said that a work still complete facts about transpersection.

Write today for deart ptive hustrated terature

WHITTER MOTOR SALES CO. Dryf. B. 3132 E. Washington, Las Angeles 22, California

BARGAINS in WAR SURPLUS LENSES & PRISMS



All Home Flooly Ground and Pollshod but Edges Slightly Chipped or Other Slight Imperfections which We Guarantee Will Not Interfere with Their Use, Come Neatly Packed and Marked.

YOU CAN EASILY MAKE

Tolorcopes, Magniflors, Photographic Godgets and Hundreds of Experiments with those Low Cost Leases.

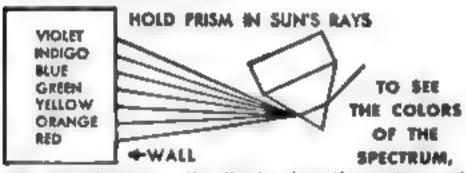
To translate millimeter measurements; 25.4 mm. squate one luch,

TANK PRISMS

In order that the tank driver shall not get shot in the face, 2 of these St vered Prisms are used to make a Periscope. We have secured a number of these, 90 45-45 degree Prisms of huge bise—5°, " long 2°, " wide finely ground and polished used to build a Periscope, camera stereo attachment, range finder ste Excellent a so for experiments, classroom demonstrations Prism easily converted into desk name plate by sfirsing god letters 100 supplied at only 10c. (Order Steck 5 300s.N) Normally these Prisms would retail from 524 to 530 each

Stack # 3004-N . . . SILVENED TANK PRISM—Price \$2.00 each. Postpaid. Bustrated Bookiet on Prisms included FREE.

FOUR SILVERED TANK PRISMS—Special—57.00 Peetpaid . . . The most sensations, bargain we have ever been able to offer HOLD PRISM IN SUN'S BAYS



you can easily remove the silvering from these prisms and hold in sun a rays as shown in drawing. White incident light which passes through prism is thus broken up into a band of primary colors known as the spectrum—a beautiful sight

CLEANING ORUSH BET-12" flexible plastic handle circular construct on 4 brushes to set range stiff to soft Stock # 504-N

Consists of 2 Force Prisms to make an erecting system for a Tulescope.

a mm. movie projecting LENS SET - Consists of 2 Achromatic Lenses, dam, 15 mm, and 6 FL, when combined of approx, one inch. Each lens has the new magnesium fluride low reflection coating

law reflection cooting

Stock # 4011-W

Five assorted finely engraved Reticles
from U.S. Gunsights An usual group just like those
desisting our gunners to train sights on Tokyo, Worth

Stock # 2035-W \$1.00 Pustpoid

RAW OFFICAL GLASS . . . An exceptional opportunity to
secure a large variety of Optical Pieces both Crown and First
glass (seconds) in varying stages of processing, Many prism
blanks.

Free Booklet on Home-made magnificre included.

Stock 2 1026-N S2.00 Postpoid
PERFECT ACHROMATIC TELESCOPE OBJECTIVE LERS

SPECIALS IN LENS SETS

Big 10 Page Project and Idea Bookiet with all sets

Set S 1-M "Our Advartising Special" 18 Lenses for \$1.50

Postpaid. For making your own powerful telescopes, low power microscope, strong magniflers, drawing projector photo ce.ls, telephoto lens, dummy focusing camers. Kodschrome viewer, stereoscopic viewer ground glass and emerging focusing a.da. For experimental optics, portraits of babies and small pets, copying ultra close-up about, and many many other uses,

Set S 18-M-"The Experimenter's Dream"-S2 Leases, Frisms and Optical Items, and New 50-Page Book, "Fun with Chip. Edge Leases" \$15.00 Postpaid The variety of Leases and Posms in this set will ease a you to conduct countries experiments, build a great variety of Optical Equipment. A sensetional buy.

NEW SG PAGE IDEA BOOK "FUN WITH CHIPPED EDGE LENSES"

Contains wide variety of projects and fully covers the fearlasting uses of all Lenses in sets listed above. \$1.00 Postpaid

MISCELLANEOUS ITEMS

Stock No	. Item	Price
3014 H	Porro Abbe Prism . Pentagon Prism	\$.25 each
2024-N	10 Pieces Circular A-1 Plate Class	
	(Diem 31 mm -lor making Flater	.25
3001-N	Lone Surface Prism	2.00 each
3021-M	Amici Roof Prism (3rd Grade)	-ZF each
4009-N	Heat Absorbing Class 4" x 5" Heat Absorbing Class 2" x 2"	does it.
2020-N	40 mm. Nog. Lone Cross Lanes .	.10 sech
3020-8	Right Angle Prism 48 mm wide	.20 GECH
	(3rd grade)	does BE.
823-N	Six Threaded Metal Reticle Cells	.25
26-N	Pirst Surface Aluminized Mirror	
	Diam. 13/4"	.25 esch
624-N	The state of the s	-24
3022-M	Round Wedge 65 mm Diam	5.00 seak
3036-M	Roof Prism-60 Degree face 15%" wide	
22 N	Inchnometer-Aircraft type	.25 soch
704-M	Lens Cleaning Tissue, one ream (480 shoots) mas Thy 2 11 - 1 - 1 - 1 - 1 - 1	1.50
M-E000	Educational Set, 1 blank and 1 Snished	1.00
	Porro Prism (3rd gredo)	doe dil.
1003-N	50 Power Microscope Lone Set .	.70
1028-N	8 Power Mounted Magnifier	.3# ench
1030-W	2" Diam Reducing Lens	.26 sech
1031-N	Perfect 6 Power Magnifier-Diam. 25 mm.	.25 sach
2043-N	Standard Crossine Rectic's-	THE RESERVE
	Diam. 29 mm	
	(Minimum order un above-\$1.00)	.25 each
POLARO	ID (Dyad)-Bultable for Experimentation	m. Consists
Stack 2	2 diam, Some imperfections in glas	.00 Postasid
	OR HODACHROME EYE-VIEWER	
	emepted lens 41 mm, diam., 66 mm F	
		men management of

TANK PERISCOPE

Complete Set Mounted Components

Order by Set or Stock No.—Satisfaction Guaranteed

EDMUND SALVAGE COMPANY-P.O. AUDUBON, NEW JERSEY



Quick, Joe! Hand me the Weldwood Glue

When you want to fix things fast ..., remember Weldwood Glue. It's quick to mix ..., easy to use ..., tremendously strong ..., stain-free ..., rot-proof ..., and permanent. At hardware stores, lumber yards, chain stores.

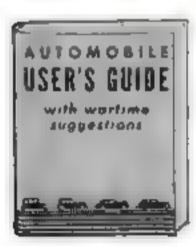


P.O. BOX 246-EP

WELDWOOD

PLASTIC RESIN
WATERPROOF GLUE

FREE BOOK Tells How To



- —get better gas economy
- -prolong tire life
- -preserve exterior finish
- keep year car in the best operating condition.

Get a FREE COPY from any General Motors dealer, or use coupon below.

Customer Research Dept., Room 1764 GENERAL MOTORS, DETROIT 2, MICH.

Please send PREE COPY of new adition 64-page
"Automobile User's Guide" containing 196
practical suggestions on wartime operation.

Mr. Mrs. Miss	place print
Address,	piesso prist
City	Zooo State
Make of car now owned.	VACC model

III ENGINEERING

Airplane-type action has been refined in the new HULL STREAMLINE AUTO COMPASS. Improved in performance and accuracy by wartime engineering Limited supply at your dealer's. Write for free circular Price \$3.50.

HULL MFG. CO.

Price \$3.50. \
.
Werren, Ohle



Pipe-smokers never weary of Walnut



With that RICH, NATURAL, NUTTY Flavor
Write for free booklet, "The Choice
of Experience," John Middleton, 1203
Walnut Tobacco St., Phila. 7, Pa.

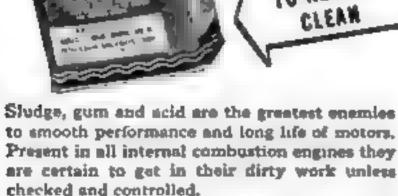
Matom-made for the Carringe-trade since 1856





don't let sludge ruin your engine





TO KEEP IT

Fortunately these petroleum residues can be controlled and rendered harmless easily and quickly with the use of LOOSITE and SHOO. For fifteen years these safe, swift working solvents have been helping to keep millions of motors in service at full efficiency. An initial LOOSITE treatment cleans the motor of sludge, gum and acid. Then SHOO added regularly with fresh trankcase oil keeps it clean. Lubrication flows freely—assuring long, economical and smooth operation.

Get started with toosite and siloo today. Your dealer has them.

If you best with oil - write for information on SILOO FUEL BIL TANK SOLVENT,

PETROLEUM SOLVENTS COMPORATION

331 Madison Avenue, New York 17, N. Y.



TELESCOPING MEASURING TOOLS

Bives You Outside Micrometer Accuracy on Inside Measurements
FINISH YOUR DWN SKT OF FOUR TOOLS

Only \$ 2 9 5 C.O.D

Plat Usest Small Petal Charge
SIMPLE LATHE WORK NECESSARY TO COMPLETE. No special tools
re-o-red Thereign ng Knurling but a trady done Kit Includes all
mate is clast machined, somble drawings and detailed instructions,
Send 22 95 cash with order and we pay postage
ALCO SMOPE, Dept. 3, 1458 Senset Sivi., Los Arquies 26, Calif.



Clean Hands

Quickly remove grime and grease from hands, and almost anything, with SKAT, original and best Paste Soap

At all grocers.

Skat Co., Dept. S, Hartford 6, Conn.







- Any old Boat... and an EVINRUDE!

- Sure you'd rather go fishing in a sleek modern boat - but it's fisherman's luck to find only battered old tubs on the best fishing waters! So you take what you get and like it.
- And after all it's the motor that counts! It means everything to have a motor that starts instantly, and pures along smoothly and quietly, through fair weather and foul, on trip after trip and day after day. Such a motor makes a world of difference to any man's vacation!
- That is the kind of performance you can expect from your new peacetime Evinrude . . . performance that, on any boat, brilliantly reflects Evinrude's 36 years of know bow in the building of fine outboard motors. EVINRUDE MOTORS, Milwaukee, Wis.

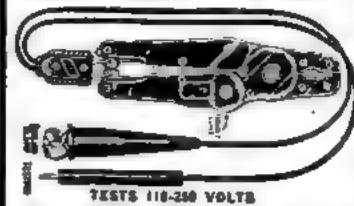
-EVINRUDE-

OUTBOARD MOTORS



BUY MORE WAR BONDS -- AND HOLD THEM!

Fuse Puller — Circuit Tester



When motors stop and lights go out, this tool quickly LOCATES DEAD CIRCLITS and safely removes blown Fuse. The Star Test Pocket Piler is made of a Transparent Pastic having in one of the legs a small lamp in series with a resistance and can be used to test 120 to 250 volts circuit. The Plier will pull fuses from 10 to 100 Amperes. Thousands of Electricians find this tool handler than Test Lamps. Price \$2.75 each without Leads, \$1.50 additional for Leads, pius 10c pustage. Can be obtained from General Electric or Westinghouse Stores or directly from us. Order NOW

STAR PLIER CO., 237 Cenel St., New York 13, N. Y.

MADE FROM IMPORTED BRIAR





Enjoy anmatched sweet smeking quality, outstanding fine grains, la modern designs, \$3.50 to \$10. At leading tobaccoulsts everywhere. Write for from Hingtrated bookist.

G. H. WEBER & CO., 146 Cator Ave., Jorsey City S. N. J.

BURNED OUT OF BROKEN ELECTRIC ELEMENTS

WITH NEW AMAZING MICHROCITE Simply decide code, a spay Notice in Paste and turn on current, band by large activity commonses. Trial order, 57 00: 4 or , 22 50 1 pound 18 op, frastrong Mg. Co., \$4.001-2, Minesapolit, Mine.



Home

factory

run as high as \$50.-\$100 weekly after a few weeks home training medical or chiropody—casy terms, no further capital needed, no goods to buy 50th year Write for free booklet.

WANT a permanent business profession of your pwn? Then become a foot correctionist. Earnings of men and women in this greatly needed ordersion

Staphenson System of Foot Correction, 42 Back Bay, Boston, Mant.

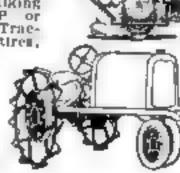
1 to 9 H P Circulars on request. War limits production. We supply repairs for all SHAW Tractors sold in our 41 years in buginess.

BUILD YOUR OWN RIDING TRACTOR—"WAR HORSE"

using old auto parts, powered by 2 H P or larger air-cooled engine, or walking type Garden Tractor & to 3 H P or convert truck or auto into Farm Tractor Each with steel or rubber tires, will plow, cultivate. Plans for building, in few hours, any one of particular tractors. above, postpaid for \$1.00 (state which wanted) or all 3 for \$2.00. Money Back Guarantee!

SMAW IMPG, CO., 5709 FRONT ST. THE RESERVE AND ADDRESS OF THE PERSON NAMED IN

SEEPS North 4th St., Colo





Make permanent, error-proof photocopies direct from blueprints (without tracings) or get photographic tracings direct from any blueprint, drawing or sketch. Save time, money—expedite work! APECO makes copies, 1-a-minute, of anything written, typed, printed, drawn or photographed—even if on both sides. No darkroom or technical knowledge needed. Get facts. Write TODAY on your business letterhead.

AMERICAN PHOTOCOPY EQUIPMENT CO. 2849 N. Clark St., Dept. HU96, Chicago 14, Ill. (Representatives in principal cities and Canada)

AMERICA'S MOST WIDELY USED





STATE

DISSTON



The saw most carpenters use

Ask the carpenters you know what makes of saws they use. You will learn what many investigations have revealed—most carpenters use Diston Saws. They will tell you that Disston Saws are faster-cutting, stay sharper longer, and can always be depended on for clean, accurate work... results which can be credited to the superiority of Disston Steel, its fine temper and the rare skill of Disston Saw makers.

Take care of the Disston Saws you now have, and they will continue to serve you well until more new saws can be released for civilian needs. Many hardware retailers and saw repairmen provide a special saw sharpening service. They will be glad to help you keep your Disston Saws—or other quality make—in good serviceable condition.

If you need a new Disston Saw or other tool for assessed work, discuss your problem with your Hardware Retailer—he may be able to help you.

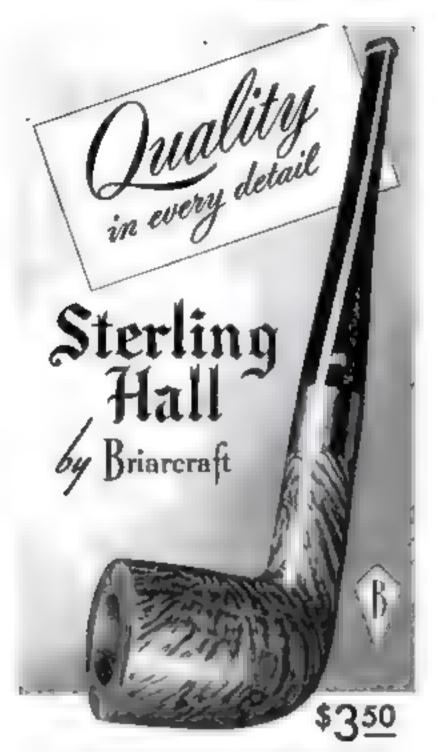
HENRY DISSTON & SONS, INC. 910 Tacony, Philadelphia 35, Pa., U. S. A.

ASK FOR YOUR FREE COPT



The Disston Saw, Tool and File Manual tells how to use and care for tools. FREE at your Hardware Store, or write to us for a copy.





You'll recognize superior quality immediately when you examine a Sterling Hall Pipe. Its perfect design, handsome grain, beautiful finish and its unart lines instantly stamp it as a de luxe product. And you II make no mistake in assuming that a pipe made with such care can be depended upon to give years of genuine smoking pleasure.

Sterling Hall can be had at the better thops in a wide range of handsome modelswith or without an inlaid steeling piver band, Individually boxed, \$3.50.

Briarcraft, Inc., 347 Fifth Avenue, New York 16, M. Y.

Electrically Welded Endless

Paramount

BAND SAW BLADES



Made in widths from 197 to 1597

Make your band saw do more work for you. The proper which of blace will extend the scope of this important machine. Laure, a Paramount Blanes are made from touch Nickel Alloy Steel properly tempered. The h accurately set and 0 ed. and all saws carefully studishtened. Send order and clock today 10 d ery will be made as promptly as war recoil look permit I can a few days to a week or two. You can obtain these saws at the following prices

26"-3/16"-5,"-5" wide, 5'6" long . 24" -/10"-1,"-5," wide, 6 " horg 5,"-3/16"-1,"-5" wide, 7'6" long . 1 10 each

Other sizes at proportional prices BURRILL SAW & TOOL WORKS
495 E Main St., Illan, N Y



HEAD PHONES LATEST

I, the Weight Finest Quarty were plus for turned in un radio or netercommontes on system Alapadantate for has in making a range bade or crystal ast Head Phones. No head hand new the 75 fired Phones With sa her toward adjustable head hands a highly used 12 3th Head Phones with the fired Phones with the head hands a highly used 12 3th Head Phones with the head hands a highly used 12 3th Head Phones with the head hands a head hands News \$1.75, Pion \$1.5 for abhipping charges send Money Order Quantity Limited. Light Weight Finest Quarter with

NICO SUPPLY CO. 540 N. 17th STIREET.



With Dar als in tool steel cutters Make moundings can age drop leaf tables grooves beading a joining 1" wide #1 50, 10," \$1.75 en l'empaid State sine hoje List & folder free

John A. Sandstrom, Box 517, Stow, M. Y.



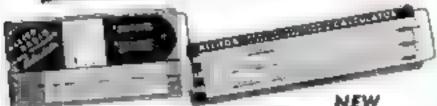


Put this OTTAWA to work for you. MAKE MONEY! Wood is bringing highest prices ever known Ottawa does more than 10 men. perated Falls trees;

OTTAWA MFQ. CO., 901 Wood St., Ottowa, Kans.







Now R-F Resumence and Cail Winding Calculator No. 37-955. Poetpoid, 25c Paruliol Resistance & Series Capacitance Culculator No. X37-940. Pastpaid, 25c

RADIO'S FINEST BOOK VALUES Specially prepared to aid radio trusting in schools and industry. Full of valuable data. Send for all six! Radio Fermulae and Date Book No. 37-752 . 19c Dictionary of Radio Torms No. 37-753 104 Redio Circuit Handhook No. 37-753 . 10c Radio Builders' Handbook No. 37-750 . 10s Simplified Radio Servicing No. 37-755 , 10c Radio Data Handbook No. 37-754. , 25c All Six Books No. 37-799...75c ALLIES FACIS COSS.

822 W. Jockson, Dept. 7-J-S, Chicago T

ALLIED RADIO

ELECTROPLATING

Complete Instructions by a practical plater, with formulas for Brass, Cadminin, Chromium, Copper, Gold, Nickel and Sliver Solutions. Price \$1.90 Money Back Guarantee. PLATER HYDE, Dept. B. P. O. Son 176, National City, California



Does More Things Easier and Quicker Than Any Other Tool!

Remains locked to the work with hands removed. Holds anything, any shape, with a grip that never slips. Is actually Hand-Vise, Clamp. Super-Plier, Adjustable End Wrench Pine Weepel Louise. Wrench, Pipe-Wrench, Locking Wrench and Toggle-Press Ai L IN ONE! Light, trim, bands we Made of fine alloy steel, Zinc plated. 2 sizes—7" and 10".

Gives 1 Hand TON-GRIP

Milichell, So. Date.

How to Cut Any Size Hole with One Tool

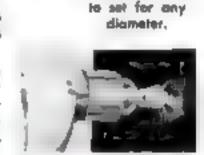
Clean, fast cuts from 34" to 11/2" diameter-in steel, sheet metal, boiler plate, dural, plastics, wood, masonite, hard rubber, fibre and other materials, with



ONLY 3

For home users, mechanics, farmers, technicates - one Bruno does the work of many fixed-radius

ideal for use in portable drill, hand brace or drill press. Highspeed steel blade easy to resharpen. Ruggedly built. Designed by cutting tool engineers. MONEY BACK GUARANTEE. Bruno No. 100 has 1/4" streight shank. Also furnished as 100-B, with but stock for braces. Cutting range 36" to 132". Either \$2.95. Model No. 101 has 14" straight shauk (No. 101-B optional, with aquare bit stock) and priced at \$4.95. Cutting mage 1" to 234".



Just like a com-

post, it's easy

livers No. 100 in electric dell' cutting 150" hale in metal box.



Brung No 100-8 in hand bress enting plantic laminare

SPECIAL CHRISTMA: PACKAGE

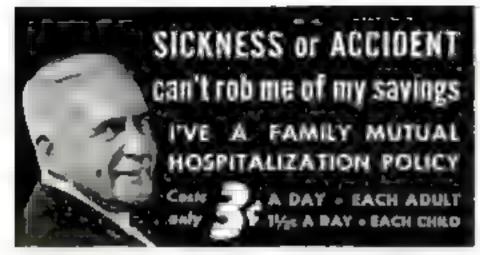
Contains Two Models: No. 100 and No. 101 Any diameter 16" 21/2" In Special Gift Package



TOOLS - Beverly Hills, California

SEND THIS COUPON NOW

Bryse Teels - Beverly Hills, California, Department PS-9 Please send me the Bruno Hale Cutters checked below. Enclosed Find Money Order D Ship C O.D. D Christmas Kir of 2 Models \$7.85 (straight short only). No. 100 \$2 95
No. 100-li, SQ Shank \$2 95 No. 101-8, SQ Shank \$4.95 □ No. 101 \$4.95



THE DESIGNATION WE ASSURED

Respital Exponent publi (beginning with the first day), up in ...

FOR ACCIDENT

Bacter Empean polit, up to \$135.00 Lace of Life by Accident Si000.00

MAR COVERAGE and EXTRA BENEFITS Childbirth Espensa pold, my lib . . .

Birkbem or accident can easily wipe out, in a few weeks, novper to you with a Family Matual Hospital action Policy, you'll be able to pay your hospital bills to ruse of accident, you will be reliablished for your doctor expenses and for loss of time from work. Your hands Mutual card adm to you to any hospital in the United States and your own family doctor may attend you bleastly appaying to children are 50% of those palk admits. paid adults.

MAN, The Transfer No Agent Will Bether You

PARTIE MUIDAL SERANCE CO., WILMINGTON SS. BEL _____

501 Shipley St., Wilmington 79, Col

Please send use without absigntion, complete information on poset Reonomical Hospitalisation Plan.

NAME.

WHEN THE RESERVE

for EVERY WORK SHOP! Easy to Plate CHROMIUM GOLD, SILVER, NICKEL, COPPER . . . For Pleasure and Profit! If you have a workshop—at home or in husiness-you need this new Warner Electroplater. At the stroke of an electrified brush,

you can electropiate models and projectsou can replate were articles faucets tools, Extures, silverware, etc with a durable, sparkling coat of metal Gold Silver. Spark ing coat of metal Gold Silver, Chromium, Nickel Copper or Cadmium, Method is easy a mple, quick Everything furnished—equipment complete, ready for -cquipment complete. use By doing a bit of work for others, your machine can pay for Uself unkin a week So Warner Electroplater right away Send today for FRFE SAMPLE and illustrated attendance ACT AT ONCE! Mail Conton. WARNER ELECTRIC CO., DEPT. 663 N. Wells St., Chicago Lt, Illinois

INER ELECTRIC CO., 663 N. Walls St. Chicago ID, Dopt. G-D Gentlemen. Send Free Sample and Details to:

Address...

State

"JACKPOT"

Hame Made COIN MACHINE

Cet this new, colorful pay-out machine for your recre-at on room! Soon pays for itself! Three fruit reels. Costs player 5c per play Pays off one quarter automatically on two cherries etc (Relains 60 for house, 40 % winnings for player) Also can be operated to pay off tokens 25c

to t up to 100 to 1 Complete with 121 metal to-kens Size 10 x 10 x 10 in. Metal construction, Wt. 16 lbs. Send \$10 00 deposit. balance COD \$49.50

DISTRIBUTING CO.

👫 NORTH MICHIGAN AVENUE 🦸 CHICAGO 11, ILLINOIS

CODE SPEE

ands of men needed. Intemptly categoring Learn at home or wherever you are quickly castly tandler Speed System Book of part colors Free a (and)er Speed System CAMPLER STSTEM CO., Copt. S-H. Sex 935, Convert, Cote. U.S.A.

TRAILER BUILDERS' SUPPLIES

To Build, Repair or Modernize! Save money on Supplies. We are the largest and most complete trailer supply House in the States. Our new large 1945 catalog 190, Blue prints and building Instructions 25c

National Trailor Ex

715 M. Seventh St. Milwaukee 3, Wis.



RID YOUR SKIN

of ug y scely lesions. Let Derm K bring you entisfying relief Not an ointment Stainless Excellent for DNY ECTEMS, Rush name and address for Special NO RISK OFFER, Send posts today Carter-Howell Laboratory, 457 Schonectedy Ave., Dept. M-14, Brooklyn 2, N, V.



ILLUSTRATED COMIC

THE KIND MEN LIKE! (VEST POCKET SIZE)

20 escorted booklets sent for \$1, Shipped prepaid in plain wrap-per No C O D orders Send tash or money order No stamps, GRAYKO, Dept. AB-682 Box 520, G. P. O., New Yo



asperience required. Fine for less underarme. Selle the wild't AMPLES FOR AGENTS Sample offer sent im demand at seco. A sent postel will de SENI NO MONEY Just or name. Existe Co., 400 Ear M., ARROW, OMB

Floyd Clymer's MOTOR BOOKS

Ah Jenkins' Racing Book

THE SALT OF THE EARTH "Thrilling story of Jenkins wor'd a Thrilling story of Jeakins world a spood recards with Mormon Matter on Bonneville Utah Sat Flats. History of world a fas est speed course Photos of famous English delivers Campbail Cobb. Eyston and details of their racing cars Non-technical. \$ 1.50 Postpaid De Luxe Cioth Bound \$2.50.

The Modern Steam Car

Interesting practical from on accommendate the formation early and latest makes, module both U.S. and foreign. Be est, engines burners described lituatrated Articles by Stanieys early steam ada How to drive and rare for iteam sutamobile University, informative book, Postpald

De Lane Cloth Bound \$3.00,

Mater History of America

World a Wonder Book of Car Bistory, Newty revised authentic story of automotive adustry some its inception Lists over 1600 makes of gas, steam, electric cars, fortudes historica. 'Scrapbook 'auppiement by Ployd Cymer and early details on Ford Chrys et Olds Durant, all others. Valuable his arrest data.

Postpaid
De Lake Cloth Beauty 24 00 De Luke Cloth Bound \$4.00.

POWER and SPEED

120 large pages! 200 illustrations' World's most famous racing book, automobile motorcycle and alrelane Words apred second charts articles by word famous speed kings Campbell Cobb Eyston others Раухипа and Bonneville recued details photos Engines, parts described \$2.50

CLYMER MOTORS, Bost. PS, 2125 W. Pico, Los Angeles 6, Calif.



Rigging Gam Tend on Contac 5 where you get MORE for your murchandres and buy for ters beign autocrine 1943 Mudals the de-Procy right must and Used Surgator to Priles, Shotgoon, Handgoon, Iram \$3—to the Sound Strp your Gons, Reals, Rads, etc., al ence, or describe fully by latter

Frede Ours at \$50. America s

Where other sources fell-ICSG comes through by mult



Get Your Copy: Fell "Guaranteed Sargain Catalog" and Swap List of new and used guns and other "hardto-find" sports items -send 25c (refund-



Meet interesting electrical operators over the covered Make your awa Telephone Amplifier De tactiphone Transmit your voice or manife to distant rooms Perform hundreds of fascinating especiments to they it can be recreated to decree of pieces. Send it now for button and free 1,000 word instruction bookist with as liquitated aspectments, SPECIAL OFFER I buildens and bookies sent post pair for \$5. Write now to DUCK MPD. COMPANY

North Ascara, IMpois

Easy to Learn "Dynamic Swing" Every Pro Uses PLAY IN THE TOR. Enjoy your game. American pair

friends, test out of the dub claim by using golf a most powerful and accurate swing. Five basic secrets give you rhythm and power, eliminate book and slice ... make you MASTER OF EVERY CLUB. Easy to make long drives and beautiful approach shots. Learn in a few days - 10 minutes' practice a day COMPLETE COURSE NOW ONLY \$1.00 postpaid, or \$1.00 plus 24c for postage and C. O. D. fee, Your money back if you're not amazed with results, so order NOW!

THE SYLVAN COMPANY 125 Seventh Avenue, IL



Free Fall Catalog

Just off the Press

Skowing Hunting footwear, Clothing, and forty-three other leather and convas specialties of our own mosufacture for compare and bunters.

L. L. Been, Inc. Freeport 261, Me.



choose AC for utmost reliability



Aircraft

Northwest Airlines have now become the fourth American line to inaugurate ocean-to-ocean service. Utmost reliability being the watchword, it is not surprising that AC Ceramic Aircraft Spark Plugs are used.

The history of these remarkable plugs goes back to World War I, when AC built the first and only ceramic aircraft spark plugs, for use in Liberty engines. That was the beginning of a long series

of triumphs shared by AC Ceramic Aircraft Plugs, including those of Lindbergh, Acosta, Maitland, Byrd, the Constellation and the C-97. Their war record is no less brilliant.

In automotive fields, AC pioneering has consistently shown the way to better spark plug design and performance.

Engineers of 2 out of every 4 cars and trucks specify AC's as standard equipment. In every type of motorized equipment, motor-wise people, the world over, choose AC for atmost reliability.

AC SPARK PLUG DIVISION . GENERAL MOTORS CONFORATION



MILDEW MIL-DU-RID ruined saved this this

 The photograph above shows a piece of fabric attacked by mildew. The top section is untreated - the bottom section is protected with a single application of Mil-Du-Rid!

Mil-Du-Rid can protect your possessions in the same way. Simply apply it to your shoes, clothes, luggage, furniture, rugs and stored equipment. Mil-Du-Rid kills mildew instantly, can prevent its return for months. It's safe to use on anything soap and water won't harm, Buy Mil-Du-Rid today at your department store, hardware, grocery or drug store.

NIL·DU·RI

A Freduct of Interchemical Corporation

I bought a Foley Saw Filer one year later had all derits pand and all derits pand and also \$ 800 on

a new home Many days ! one as much as the Kelloge

Rived 2 150 among Wa have a bereit beattern weeked up and comment here werked up

The America June 1999 may have fired \$50 came, made \$100 As fire a car, period fired the beautiful property time—have more than

Can take the of

L. Tarrent series belt my old job test terprem-ber and in 10 months have



Interchemical Corporation Trade Saics Division, Dept. N-95 Fair Lawn, N. J.

Please send folder, "What is Mildew?

How to Prevent it. Name.....

Address.

My Dealer's Name...

This is the way to Make Money

MACHINE SAW FILING WITH the Foley Automatic Baw Sier is the modern way to recondiwork-no experience needed-no eye strain Start in spare time-Foley filed saws cut so smooth and fest, they will edvertise for you, bring you new customers and a steady supeat cash business

The Foley is the ONLY machine that flies all hand saws also and cross cut circular band enables you to handle BOWE work from schools shops and factories as well as farmers, car-

penters, stc Send for FREE PLAN

Shows how to startcanvagsing. Send coupon today





FOLEY MANUFACTURING CO.

919-5 Fo by B do Minneapolis 13 Minnesola

Send Free Plan on how him by business, no obligation.

Name.

Adares

ELECTRICITY FOR ANY JOB

ANYWHERE



Reliable, economical electric service any where anytime, with an Onan Electric Generaling Plant. Driven by Onan built, 4 cycle, gasoling chartes, these power plants are of sing r-km-t, compact de-plan and stordy construction Suitable for all types of service Modris range from 350 to 35, 000 watts. A C types from 115 to 650 volts. St. 60, 180 cpcles.

aingle or three-phase 606, 500 and 800 cyter single phase; nine special frequencies, D.C. typen range from 8 to 600 vetts from writing types available Write for engineer or assist-

D. W OMAN & SONS, 1831 Royalaton Ave-

nue, Minneapelle S, N A

AMAZING MYSTERY



Biarties Everyhedy,
With this Electrosis BUTTON
South was an onto
South was Transmissed. Attack this bottom is piece of
conditioned drammis conversation to another room. Musir a so transmisted to distant places. Most interesting,
ciectroses, apparates ever discovered, Enables you to
perform bundends of experiments. Be liky it can be
contrased to detend of places. A Pre-War Product
Exertronic Button including 5000 word instruction hook
list with 50 1 uptraird experiments postpast unity 51 to
Dectronic Products Company, Enlet Charles, III.

Lumber-Plywood Available Married Fluid wants to send you be an and he is suffered by the suffered by the suffered he is suffered by the suffered he is t



HEATING Cooling Blowers (K. Di. Metal Cabineta, Steel Wheela, Shafting, Bearings, Gas Burning Furnaces, Oil; Burning Furnaces, Conversion. **Blowers**

D) Burners Stokers, Cas Ranges, Thermo-nia Hot Water Healers, Fretche Crajar opper Tubing Pumps Wholesale & Retail falls Burners Controls PRINCES CAPPE 48 18 Charitan Strd. LINCOLD 6, MEND

Blueprints \$1,00 - Catalog FREE tank partypid for \$1.00 includes prints for Louis 10' Shaper, delling Machine, Delli Fross, Was. 18' Bond Saw & Jaimer Phile or some finished somings are deligible for those tools save up to \$0%. při nadparaljí se vypřivyt.

of Mary Couly-and for the Mary of Soft-Angles THE RESIDENCE PROPERTY AND PERSONS TO

LEWIS MACHINE TOOL CO. P.O. Sec 110, Sec. A, 8297. 0-32, LOS ARRELES 31, CALIFORNIA

Qualify for Certified Grapho-Analyst Degree.

Earn up to \$100 weekly up to \$1 hourly spare time in new uncrowded profession Graduates in employment and credit fields. police departments routle, and in private practice as Personal Problem and Voca-tional Counselors 3,000 word test lesson and Bustrated GRAPHO-ANALYST Free

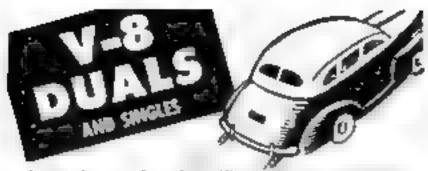


ADDRESS A.I.G.A., INC., 126 JOPLIN,

A DANGER SIGNAL

Often associated with Hardening of the Arteries, a Stroke Paralysis, Heart Trouble, Kidney Disease, and other grave complications. Resultful treating methods of the Ball Clinic have proven dependable for nearly a quarter of a century Send for FREE Blood Pressure Book today. No obligation.

BALL CLINIC, Dept. 5160, Excelsior Springs, Mo.



A genuine steel pack moffler WITH A REAUTIFUL MOTORSOAT TONE. Sondee Mufflers feature improvements for in the lead, years ahead of competition, increases mileage and power, reduces back pressure and gives better performance. Savings in gasaline will pay for a Sandee Muffler.

> V-4 FORD AND MIRCURY DUALS \$17,50

SINGLES-FIT IN PLACE OF REQUIAR MUFFLIE

Chav., V-8 Jord, Plyst., \$5.00 Chrys., Olds., brick, etc., \$7.00 These methors will outlest two regular stack replacements. Dealers Wanted

WESTERN AVE., LOS



MAGIC CUTTER

Cuts up to 4" hole in & plastics, wood and metal. Wonder tool for ampteurs and professionals developed by famous lab for own use. Send \$1 to Tool Division ROBERTS ASSOCIATES 518 Madison Are., New York, 22





Fix Your Own

practical home course. Just out interesting hobby profitable too Save money by doing your own repairing at home. Easy if you know how Frice now only \$1.00 Details FRICE.

THIES JEWELRY STORE, Gange 5, Illinois



WATCHMAKERS TOOLS.

FREE CATALOGUE of Precision Tools, Equipment for Development Work, for the making of New Worlds.

"'Mail Orders Only"

PAULSON & CO. CHICAGO 3.U.S.A



-Maken wood sawing fast and easy. Can cut enough wood to pay for itself quickly Eastly moved while attached Big heavy blade. FREE details.

OTTAWA MFG. CO. W-901 Gak Ave., Otlawa, Kami,



What gives each file a guiding mark Like lighted street signs, after dark?

At Stationery Departments Everywhere



PERHAPS you plan to use extra heavy paper.

Or you want to strengthen paste for paper in rooms where air may get damp—such as in the lotchen or bathroom. To meet these special conditions, make a standard glue mix, using 15 lb, of Casoo and 1 lb, water for each past of liquid paste.

When thoroughly dissolved, stir Casoo mix into the paste. It makes paste stronger and more water-resistant. You can use Casco for 1001 jobs. And here's why so many folks prefer Casco for general wood gluing:

Unusual strongth: Casoo Glue sets chemically, Doem't just "dry out." Casoo becomes as strong as wood itself and is highly resistant. to dampness, heat, and time.

Easy to mix: You just add cold water and stir. No heating problems.

Economical: You use Casco as you need it. There is no waste.

For water resistant projects and special outdoor jobs, get Cascarrate. It's a complete-

ly stamfree urea resin adhesive. Cason Glue and Cascamite ate avuslable in 10c. 25¢, and larger sizes at all hardware stores.





WRITE FOR FREE Gluing Guide containing over 40 household gluing hints, Address Casein Company of America, Dept PS-95, 350 Madison Ave., New York 17, N. Y.

Powdered

Sets chemically—hardens permanently i

Buy War Savings Boods and Stemps regularly.

Get Your Copy



Selected action photographs by top cameramen of Army Air Force, Navy, Signal Corps, Marine Corps vividly portraying World War II on land, in siz, on sea! Strikingly reproduced in attractive pocket-size brochure. Get your copy at Graflex dealer s or send 10c, to cover handling, to GRAFLEX, INC., ROCHESTER 8, N. Y.

(Formerly The Folmer Brothen Corporation)





Kit tacjudes 23 different items scraich removers for alight actatches, the ordered whades of their ac stocks for deep finishe but the of high and dark stains shading acquer alcoho, tamp with first attainess after aparola touch up frushes arratch at the steel wond andipoler rubtime hould finched in handy leatherests finish case Send for it lodge Bear investment of lifet me Fully guaranteed Detailed instructions supplied

AMERICAN HOUSEHOLD BUREAU Dept. A. 520 N. Michigan Ave., Chicage 11, 11.



Build with BUILD Composition

Strongly reinforced with chear wood Modern atream 1 and 700f, waita and futters tow as \$1 to for materials garage \$20 200.50 pouter bother \$50 Ferm buildings for a few dollars. However, formulate its made wall be ph buildings for a few dollars. However, formulate I abort and cutaide dates roof wall and foor title in color and durable wellboard of aswdust for a few cents. Here and windows Also are tional cetting. 50 moneyasving buildings fixed. Mixer and saw the ly made from old auto 40 We time Plans. Earn \$10 a day, Guaranteed Liustrated instruction book \$1 bit want for a few cents. Some part serap wood and metal Make tables can peta comes. Some part serap wood and metal Make tables can peta chears rarks aboves, inclosed sinks lawn nevel se and toys. Over 500 to profit 500. Hollows profit 500. Also since weed to make account and used to a force and many other to make account shop Machiners, tools, also red weed to me from old auto parts and used notices 11 unitated 500 work May of the lands described above \$2 to pus paid \$2 to \$5 asircted home she projects \$00 to \$5 portal All of the lands described above. Doest, \$3 asircted home she projects \$00 to \$5 portal All of the lands described above. Doest, \$5,000 to \$5.00 t HOME INDUSTRIES, 1318 So. 30th Ave., Dagt, PS. Omaha S, Nebr.

BLACK on WHITE for BETTER SIGHT

WYTEFACE Steel Tapes have black graduations on a crack-proof

white surface. Easy to read in any light, from any angle, Faster measurements with fewer errors. Designed for hard service. Resists abrasion from rails, pipe, rocks, concrete. Protected against rust.

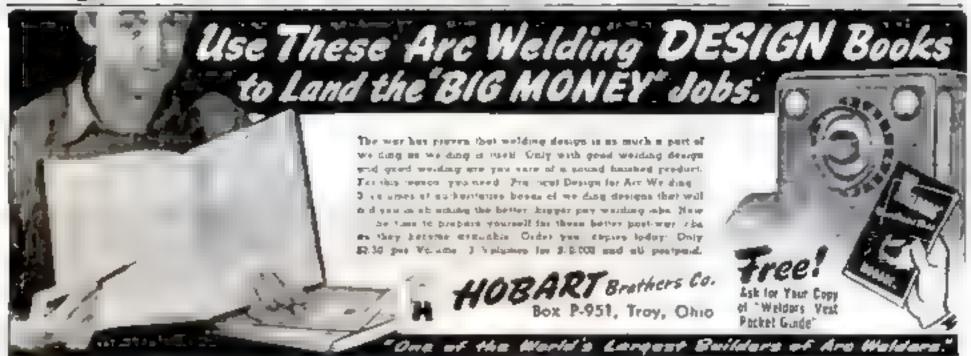


KEUFFEL & ESSER CO. 831, 1867

NEW YORK • HOBOKEN, N. L. CHICAGO . DETROIT . ST. LOUIS SAN FRANCISCO . LOS ANGELES



Drugbling Reproduction Trucke Kousemath and Makerula Side Rules Materials Total



RIGHT TO THE POINT!

Every "Yankee" spiral screw driver is right to the

point. Every part is ingeniously designed to speed work, cut down man-hours. Painstaking design and simple strength are typical of all "Yankee" fine mechanics' tools . . . whether Tap Wrenches, Vises, Automatic Drills, or Bit Braces,

"YANKEE" BPIRAL SCREW DRIVER No. 1984. A Size for Every Purpose

YANKEE TOOLS make good mechanics better North Bros. Mfg. Co., Phila. 33, U.S.A. Established 1880 -

Makers, also, of "Yankes-Handyman" Tools



Cala log with 800611 (colerations of laborator Apparatus and for 15 cents Cetatog Hat he possessed to 10,000 chemicals, frugs, minerate etc., and 1700 actest he books sent for 25 mints. 100 actest he books sent for 25 mints. 100 actest he books and for 25 mints. 100 actes he books, 10 cents.

LANGRAYONY MATERIALS CO., 7317 Vintendes Avg., Chronge 21. 18.

PRINTED ON CACH!

500 Personal Labels only 50c postpaid! Two-colors handsome blue printing Two-colors handsome blue printing of your complete name and address on attractive white gummed label paper! Use on letters, envelopes, postcards, checks books, tools ear cases, etc. HUNDREDS OF USES! Wonderful for those in Service! Order today! FAST SERVICE Limited gupoly Money-back Quarantee

When Writing Advertisers Please Mention Popular Science Monthly







SMOOTHOM





BUT SMOOTH ON in 1% az , 7 az ar larger containera from petr hardwats dealer, or if necosoury from the

SMOOTH O

Those boiler leaks, cracked paper, loosened joints, fixtures, handles, bolts. screws, can all be remedied promptly, inexpensively, se-

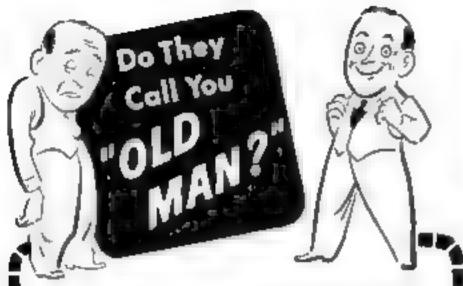
curely - without having to wait your turn for a busy mechanic or repairman. Just get yourself a can of SMOOTH-ON No. 1—the handy Iron Repair Cement-and tackle the job yourself. No previous experience necessary. No heat. No difficult processes to learn -just follow simple directions. Smooth-On is always dependable, makes durable repairs. Popular with mechanics. plumbers, repairmen since 1895.

You'll find any number of convenient uses for Smooth-On in home, garage, shop. Little jobs and big ones, From tightening loose tool hundles. casters, drawer pulls to repairing cracks and leaks in pipes. tanks, radiators, auto cylinders, crank and gear cases, etc.

Get This 40-Page

Shows you how to save time and money and get repairs done right when you need them most, Easily followed directions. 170 diagrams Handy index. Fits the pocket Yours for the asking - just

mail the coupon. --- Sian and Mail Now ----Smooth-On Mig. Co., Doot. SR. 579 Communiper: Ave., Jersey City 4, 8, J. 1895-1945 Please send the Smooth-On Roudbook. Name - - -Contuct of Dependable Address. Service



 Some men are angered, embarrassed. at being thought old because they tire so quickly, get all fagged out. But, isa't there a reason for feeling like an old man at quitting time? Many men do not suspect that constant strain and drag on delicate cords in the "Vital Zone" may be to blame. Often the gende, comforting, firm support of a Bauer & Black Suspensory brings relief.

FREE BOOK TELLS FACTS



Do you know why so many men say they feel years younger, livelier, with the scientific support of Bauer & Black Suspensory? Thus free book gives you valuable facts every man should know about "Vital Zone" fatigue. Send for your copy today. No obligation.

Suspensories

Division of The Kendall Company Dept. 8-412

2509 South Dearborn St., Chicago 16, Ill.

Yes. I want the real facts about Suspensories. Send me your FREE booklet without obligation.

Address



HARD-TO-GET



Real bargains on bundreds of hard to get Easts and or rong parts are lated in our arest FIRE? by each Proposition of eartsfied, escady cust mers up our lists. Send for your Fithh money saving he ettn today

NATIONAL ELECTRONIC SUPPLY

Chicago 2. III. 422 W. Kinzin Dept. #5-9

HANDY ASSORTMENT & S. FOR MECHANICS - HOME USE FOR MECHANICS-GARAGES

 NUTS • BOLTS • WASHERS RIVETS . SPRINGS . BRACKETS

MORE THAN 1.000 PIECES

5 full pounds—a veritable treasure chest of fastening devices for every practical use. Satisfaction guaranteed, Order now \$1.98. SPECIAL-2 mountments, ever 2,000 pièces, for \$3.69.

MUDSON TRADING CORPORATION

The House of Handy Assortments \$-161 West Mubbard St., Chicago 10, III.

FREE! Bandy List of Special AND WANELITE WASHERS- RUB-BCR WASHERS and PADS-FELT WASHERS and PADS-FELT WASHERS AND COMMECTORS-BORINGS-SELF TAPPING SCREWB-SELF

New Designs In.

MEETS CAR!

Mederatze Your Gue! Improve Your Score! Most durable grips made. Positively un-

breakable! For Cult, Smith & Wessen, Hi-Standard, Origies, Luger & Mausers in a wide choice of beautiful designs in ivery, pearl, walnut, onyx, etc. Low prices. FREE CATALOG, Dealers Wanted.

SPORTS,INC..(Mfrs.)5501Broadway,Dopt,S-9,Chicago 40.IIL

Make Madolek your buying headquarters for Ratio Kie route repair and replacemen needs Large stocks passes from most complete orientates of all available firms at twest prices. Your orders receive appeals attention for fastest del very Bend today for FRKK Padoleh Buying Caids. prices four orders of all systems four orders or for fastest del very madolch Buying Caldo.

RADOLES CO., Book, J.-106, AUT W. Co



Buying

Gunde

Antonia Charles

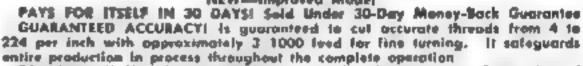
ARTHRITIS - NEURITIS - SCIATICA Why continue to suffer the agoble-ing pains of these diseases when the usual remedies have failed? Learn about a new trustworthy, modern.

non surrice! treatment Chalc's FREE Book.

treatment method. This mervelous completely explained in the Ball Book. Write today. No obligation.

BALL CLINIC, Dopt. \$100, Excelsion Springs, Ma.

New-All Quick Change Gear Box Increases Production Up to 1000% NEW-Improved Model PAYS FOR ITSELF IN 30 DAYS! Sold Under 30-Day Money-Back Guarantee



DRASTICALLY CUTS LABOR COSTSI No time lost finding geors. Inexperienced workmen tastly produce top output. Easy to install. You simply drill and tap

PRECISION CONSTRUCTED! Precision constructed throughout with nears of quality habbed steel. Gear Box housing is made of high grade aluminum allay casting-with replaceable branza bearings.

> For LOGAN, POWERCRAFT, ATLAS, and CRAFTSMAN MOODY & CLAUSING \$135.00

All sizes lend screws......\$12.00

All prices F O.S. Los Angeles

WESTERN AIRCRAFT TOOL CO.

650 No. Heaver St. Los Angeles 4, Colif.

NOmendy 2-4711



BIG MONEY NOW IN LIQUID MARBLE

regardless of your age, sea, or previous experience! I. LiQuid MARBLE, Make beautiful artificial Marble Slatis. Pour from liquid state. Glazed or unglazed. This marble may be mottled, veined, multi-colored or left to original snowwhite state. The color is actually a part of the murble! Does not fade or wear away, Liquid Slarble is unsurpassed on kitchen or bathroom walls. Easy to make and install, 2 PLASTIC FLOORING. May be made in any color or combination of colors. Gives a lifetime of wear. Dust-proof, Soundproof Verminproof Resilient to the tread. Lay out solid from wall to wall or in pattern design of various shaped blocks. 3. FLEXIBLE MOLDS. For plaster custing. Make your own moulds for few cents each. 31.00 in raw materials will make up to \$25.00 worth of finished goods. We furnish names of buyers. Write now for FREE information about our big three money-making opportunities! Cet in on busy season just starting. Send penny postcard or letter. No obligation.

COMPO-TEX. Box 786-GS ST. LOUIS 1, MQ.



INVENTIONS FINANCED

NATIONAL DISTRIBUTION ESTABLISHED YOUR NEW PRODUCTS DEVELOPED

Established manufacturer desires new products to finance, develop and sell for you, Engineering advice available. Your rights protected 100%. Patented or not we can help you make your ideas pay. Send complete information and description.

RICHMONT, INC.

215 W. 7th Street,

Los Angeles 14, Colif.

1 10 - VOLTS AC

with KATO EONVERTERS Furnish standard 110-v AC from 32 110 or 220 v Dt Good deliveries an sizes 150 through 2500 watta on priority orders. Good deliveries on 5 71; 15 & 25 KW AC generators Migris of motor generators from they changers and high frequency generators







EXPANDING SAFETY LEATHER WATCH BRACELET

Mow Invention! Fits watches with adjustable plan. Made from the fixest Gennius Leather. No other Watch St ap at any prior has these Patented advantages.

SAFRYT WATCH STRAP COMPANY, Dept. 18, 1544-lat Ave., N.Y. 29, N.Y.

Right () Watch Bearwarts send priors for draters ().

() 1 will pay postman \$1.00 ° O in charges & postage,
 () 1 enclose \$1.00 Send watch bracelet post paid and insured. Regulated in since within 2 marks, for perfect 6t much size of wrist: Small () prediction | Large ()

Name (Print)

Address.



LOOK <u>FIRST</u> TO YOUR COMFORT!

Make your modernized home confortable in coldest weather ... refreshingly cool in summer ... by applying Balsam-Wool Sealed Insulation in the arrow Balsam-Wool makes homes more in able ... provides fuel savings up to 20%.

CREATE EXTRA LIVING I

New rooms or partitions are quickly built with sturdy Nu-Wood Insulating Interior Finish—with its beautiful, fade-proof colors and velvety texture. Nu-Wood also insulates and hushes unwelcome noise.



SOLVE DECORATING PROBLEMS-

Nu-Wood Interior Finish covers old walls and ceilings—comes in a wide variety of pattern combinations. Use with Kolor-Trum moldings—predecorated in harmonizing colors!



DON'T WAIT-START RIGHT NOW!

Ask your lumber dealer for full information about Balsam-Wood Scaled Insulation and about Nu-Wood Interior Finish, For additional information and literature on Balsam-Wool and Nu-Wood, mail the coupon!

nd Nu-Wood, mail the coupon!	17
WOOD CONVERSION COMPANY 211 9 First National Bank Building St. Paul 1, Minnesota Please send me full information on modernising with Balsam-Wool and Nu-Wood. I am a Hume owner [] Renter [] Architect [] Contractional Contractio	
Yame	
Gir State.	
Balsam-Wool SEALED INSUL	

BALSAM-WOOL . Freducts of Weyerhouses . NU-WOOD

Buy War Savings Bonds and Stamps regularly.



Store Route Plan PAYS BIG MONEY

BELL COUNTER CARD PRODUCTS
Build a good paying basicom of your own;
Call on design of all 1 nds show delicanlyadvertised Aspirio, Vitamins, Counselies and
200 other successition high and 10s retail
peachagus, high quality. Attractive counter
displays only ground fast, Free book gives makeing fasts. Write1



WORLD'S LOWEST PRICED ADDING MACHINE

IDEAL FOR BUSINESS OR PERSONAL USE

ONLY \$250

FREE!

Each Maby Cuptolator in Beautifut, Fith-looking Leatherette Cans—at no enira Cost



Pits vest pocket or purse. Guaranteed accurate, Operated as easily, and as reliable, as machines costing many times as much. Not a toy Substantially made of 28-gauge steel—guaranteed for life against defects in construction. You positively can't buy a calculator of equal quality for

as little money. ACCEPTED AS THE FINEST LOW PRICED CALCULATOR FOR OVER 30 YEARS! Operates with a flick of your finger Adds, subtracts, multiplies, divides—counts up to ten million Pays for itself over and over in mistakes avoided, and time saved. MAKER IDEAL GIFT.

Sold on a positive money back guarantee. Send only name and address, pay postman 52 50 plus postage (send full cash it outside U.S.) Money back within 10 days if not delighted. AGENTS WANTED!

CALCULATOR MACRINE CO., (Mfrs.) Dopt. 458, P. O. BOX 2118, CHICAGO, N.L.

PREVENT WASHDAY MISHAPS with TITE-LINE Clothes Line Holders

Hiring your clothes line on TITE LINE clothes line holders. It s quick. It s easy It s the surest way to prevent that exasporating washday disaster — broken clothes lines. Each sect on is securely gripped — a lane break affects only one section EASRT MITALLES ON PLAY ON SOURCE TITE-LINE cirches the holders are used in attim hasaments, sutdoms — wherever clothes line is maddeness time, myse time, prevents track and kints, holds how tight, no theing. Get TITE LINE at your favorite bardware or variety store if not in stock, send so your

THE MIDLAND COMPANY

NOW ELECTRICAL APPLIANCES

dealer a name

with CHANITE Ball-Welding ELECTRICAL HEATING ELEMENT for ... Severals smears, instructions enclosed. \$1.00 pastgald. Guaranteed mathing like it.

CHAPITE SALES COMPANY, 914 South Main, Fort Worth 4, Texas



LASTS FROM 4 to 6 MONTHS

NOW is a lifty you can make longe, slipping dental place at some and comfortable Est talk in comfort laugh freely for ' Gum Gripper' enables you to enjoy that feeling of almost having your own teeth again?

• APPLY IT YOURSELF—AT HOME

""GUM CHIPPER" amount plantic Reliner tightens dental plates quickly eaches them hold firmly and fit the new! Just aquoess from tube optend evenly put plate in mouth west it while "Gum Gripper" sets in few minutes. He healing necessary

DUST ON ANY DENTAL PLATE

"Gum Gripper" will not harm denium or levitate game Sanitary tasteless odertees Recht mouth sweet and clean prevents sort of an Application of State of Sanitary or so cost. Can be arrested to last the manned Rev A J Wigley Pittsburgh Fa writest Best material I ever used I have not reliced my lower teeth for 2 months."

SEND NO MONEY - Order a tube today-it's only \$1.00 Thi out and mall coupon below You i, be delighted? Satisfaction custanteed or your maney back

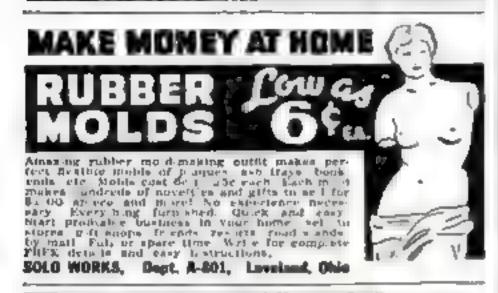
FREE

Generous size package Destal Plate cleaner inrisded free of extra cost Cleanses destal plates without brushing Wall not harm desture.

GUM GRIPPER 127 N. Deutborn St.

Gum GRIPPER, Dept. 72-F 127 N. Dearborn St., Chicago 2, FN, Send me a tube of "Gum Gripper." satisfy or it will not cost my a penny	
Of will deposit \$1 00 plus postage with arrives. Disclosed in \$1 00—You pay postage,	postman when buckage
ADDRESS	,
<u> </u>	STATE

Send for pamphlet telling why your pipe becomes strong . . . and how to prevent it. A penny post card will do. WRITE TODAY FALL. TAYLOR PIPE SHOP, PIQUA 1, OKIO.





PLYWOOD

Beautiful non-priority airtrait and tob-net stock Perfect for many projects schools 1 32" to it; ponels

and for general construction. Thickness 1 32" to 1"; ponels 6"s6" to 48"x96". Fir, gum, birch, walnut bab, makegany. Rectanch of Campiels (ists 10s. Write today)

CARMEN-BRONSON CO., Dept. 9-A

165 Cast Th rd 51.

Mount Vernon, N. Y.

PATENTS — INVENTIONS

We will purchase patents, inventions, processes for manufacturing in the U.S.A. and abroad. We also offer opportunities for world-wide distribution and sale of your products and inventions.

J. J. BERLINER & STAFF

212 Fifth Avenue

New York 10, N. Y.

SSO CUTS PER MINUTE Make money sawing wood. Use O'tawa—lastest cutting. Cuta large, small logs easiest way. Fells trees. One man operates,

Make money sawing wood. Use O'tawa—fastest cutting. Cuta large, small logs easiest way. Fells trees. One man operates. Thousands in use. Built to last with heavy, stiff saw blade. Positive safety clotch control; uses power take-off any tractor. OTTAWA MFG. CO., DSO1 Forest Ave., Ottawa, Kan.



Revolutionary
COMFORT!



744 IS ALLYOU WEAR

NO SEPARATE BATTERY PACK!

NO BATTERY WIRE!

About 1/2 the Weight and Bulk of Most Hearing Aids

A nationally known quality, lifetime hearing aid. Pleasant, life-like hearing. Plug in tubes, replaced as easily as a light bulb. Inconspicuous, flesh-color ear piece and cord.

ı		_	-
	Ŧ	÷	
ı	9	- 4	
ł	?	×.	
ı	83	3	
ı		4	L
i	Ξ	7	r
ı	F	2	
ł	Ξ	"	
ı	Š	i	
ı	36		

BELTONE HEARING AID CO. Dept.PS-9,847 W. Jackson Blvd., Chicago 7, III.

Sies: Please send FREE booklet on BELTONE

NAME

ADDRESS.

CITY, ZONE AND STATE



The World's STRONGEST

AMAZING Stranath

PLEXIMAR yet up ch-dering and forms a practice, y upbreakably bound. The only reserved of in hind is character tests power all our rising i neural ed for adhering metal, to come est update power would, printerly a cuts, plantic and hundreds of other neces.

TA-FAST Cement

Almost Impossible STA PAST it stove test. To

To Pry Apart | the later leaf of the later for building of the later planes, the parameter of the later planes, the parameter of the later period of the later period

AMERICAN WOOD TYPE MFG. CO., PS 270 Lafayette \$1, New York 12, M.

IF COMFORT HAS BEEN A LUXURY

asthma RELIE

A Medern Inhalant Method for Relieving the Symptoms of Arthme of Non-Cardiac Hature and Hay Fever

Money Back Guarantee

Send for Free Book, Dept. PS

BREATHEASY DISTRIBUTORS, INC. OF DELAWARE

65 Cadar St., Seattle 1, Washington

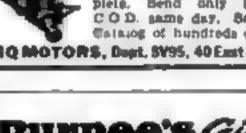
Use This or Any Similar Product Only As Directed by Accompanying Literature



ENGINES IN STOCK

The O. R. Q. ministure gasoline engine that really operates in still available. Over 100 000 cold to date. 1/3 E. P. Complete with fly-wheel and propeller, fuel. III accessories and full instructions. Pully bench tested and ready to run, Power for all models \$20 compiets. Send only \$1.00-Shipped Collect C O D. same day. Send for free littainsted Calaing of hundreds of hobby items.

GHQ MOTORS, Dout, 8Y95, 40 East 21 St., New York 10, N.Y.



Plant Seeds This Fell for boggest, best Larkspurnest spring. You'll

have large dou de flowers on 8 to 5 4-ft. spikes. Easy is grow. To try, we'll send a table Pkt Burpey's Grant Double Larkspur free, with directions. As colors on sed Send stamp for postage Surpey's Seed Catelog FREE.

W. ATLEE BURPEE CO.

279 Burpes Bidg. Philadelphia 32, Pa. 279 Burpes Bidg. Cliebes, Jowe



STANDARDS TO POST MANUFACTURED



before available, including -

14 6

find Grigor

catories

MODEL FY-10 TACKLI BOX



A "find" for fohermen 9 comportment adjustable tear . pecks or stucks sun our for any size book or lure entally because of recented handle ... and grape for heavy leads ... rost-resistant banges . . . a roof key lock ... large (16" z 7" x 6%") . . . son-corrosive rich green baked mamel finish.

Just Off the production line . For every home and workshop. Not a damiy war-time product, but a really ragged mal how made of

high grade, heavy gauge steel. Large size (16" x 7" x 696") with ingenious 9 comparament adjustable tray . . . recessed handle for easy storing . . . and graps for beavy loads . . . long wearing hanges, carch, lock and hasp . . . finished in green baked snamet.

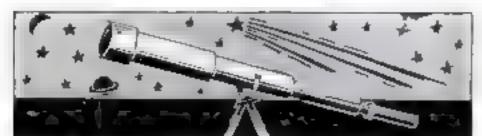
BELIVERED TO YOU HAMESIATELY WHOM RECEIPT OF CHECK OR MONEY OR

Please must immediately the 1946
| Model SX-45 Tool Box at \$3.75
| Model PV-19 Pashing Totals ion at \$5,95 for which I have at- A closed check [], Moury Order []

UNION BISTHOUTORS, Inc., Sex 73, Shellan A, Los Angules, Cultiversia

State. POPULAR SCIENCE

276



100X ASTRONOMICAL LENS KIT

ONLY

Thrill yourself and entertain your friends with such heavenly sights as moon craters the beautiful rings of Baturn, comets, double stars. Pascinating hobby for you

or an ideal gift for that boy of yours

Wit includes all optical parts seeded to build this powerful 6% ft. scope, a 3° dia., 75° FL, objective lens and two assembled eyepieces of 50% and 100%, scientifically designed and matched, ready to mount. New, perfect lenses not salvage ground and polished, Remaining materials needed are readily found.

EASY TO MAKE

And so simple to build too. Even a boy can follow the easy instructions furnished with each kit. An evening of easy pleasant educations, work and this wonderful scope can be

Most surprising of all is the unbelievably low cost \$1.95 check or money order brings this complete precision kit to you postage said. Order immediately to get yours without de sympacy back guarantee. We ship the same day order received. Address an envelope now to

P. S. BEELERSCOPE CO.

Box 235 North Hollywood, Calif. Dun't forget your ceture address and your rematance by the way if you enclose two one totter biles, we'll return the picket change with your kit bo it now





FREE #2-PAGE HOOKLET to in bil about this absorbing hostly for sk I ed tradestoen, bijemess and professional in the Gave professional cours of sat stact on and reasa ion by loang your ain waters still actions which performs and a node the fire real to dur. It a easy and latively ineapened a tiet started now Sond M once for our free snoklet Your Model Hauroad

LHOADIH MAGAZIMI DEPT, NR MILWAUKEE 3, WISCONSIN

WAR SURPLUS BARGAINS



M 5 TANK PERISCOPES. new, original boxes \$3.00, plus 6 ib. postage. WELDING CABLE 300 amp. \$25. per 100 period taxas it. 4 POWER GERMAN GUN 48 all films SIGHT6 50.78.

4" LENS LANTERN \$2.76

Many other pargains in motors tools bobby and sporting equipment Send 2 dimes for French Company and sarge catalog or catalog

CONVERSION OF GOVERNMENT SURPLUS CO., 253 N. 3rd St., Phila., R. Pu.





How to Find a Business You Can Start on a Shoestring!

SEND today for two new FREE booklets revealing scores of profitable businesses you can quickly and easily launch in your own town with as little as \$1500. no plant, machinery, merchandise or

skilled help needed'
1, "Opportunities for Limited Capital" (48 pages) points out dozens of opportunities to go in business for yourself. 2. "Your Place in the Post War World (64 pages) describes many of tomorrow's new jobs in 14 promising industries needing workers, dustributors, salesmen and capital.

To obtain both FREE booklets simply return this ad NOW with \$4 for one year (24 liques) or only \$5 for 2 whole years (48 fastes) of FORBES, the Magazine with the new service feature "Opportunities" giving complete details of an unusual business opening—every issue,

Address Dept. B-07.

HRADOUARTERS FOR ABES NEW BUSINESS IDEAS

120 Fifth Avenue, New York 11, N. Y.

TRAILER AXLES, HITCHES, AND PARTS

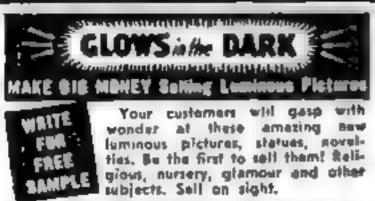
all you are interested in purchasing trailer axion, hilches, and other trailer parts, contect un promptly. Company house trainer blue priote, 25.00. Write for free literature



HAMMER BLOW TOOL COMPANY, Dopt. D-1 WAUSAU, WIS,







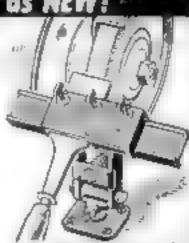
Madison Miliz, 303 Fourth Ave., New York 10, N. Y.,



Keep your Plane Irons and Chisals SHARP as NEW!

Unique grinding attachment insures a perfectly straight hollow grind on plane irons and chitals. Results in a sharp, freen, even-cutting edge. Adds life to tools—permits better and faster work. Enables you to do an expert grinding job. Easy to install and use. Endarsed by home traftsmen and corpenters. Satisfaction guaranteed—write for falder.

READ-LEWIS MACHINE CO. 391 Third Ave., Troy, N. Y.



At doulers or sent direct on receipt of \$6.95.

PERSONAL STATIONERY!

Your Name & Address Elegantly
Printed on 40 Sheets Whippet Bond &
20 Matching Envelopes --- only ---

We will elerantly print anyone's hame and address, business or personal style, on 60 shape of crisp, new Pihippet Bond Stationary (made by Hammermill), and on 20 matching envelope—all for only 25st Or, if you end \$1.00 for four cuts well include one extra set FREE of any extra charge—or System all peripaid! Same name, or as many as 5 different names no stationary Money Sach Guarane the Supply himsel Order New! WESTERN STATIONERY CO. Doot. 238-J. Topoka, Kanesa



The SUPER SYSTEM

of Natural Physical Training builds health and strength Send for my free bookset 'Building A Better Body', Also forward to me, postbelow

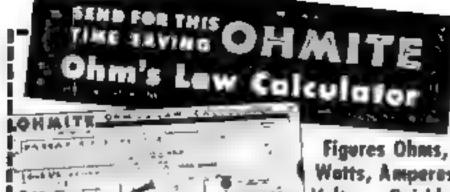
HARRY GOOD, 3261-5 WATSON RD., ST. LOUIS 9, MO.

Tired Kidneys Often Bring Sleepless Nights

Doctors say your kidneys contain 16 miles of tiny tubes or fitters which help to purify the blood and keep you healthy. When they get tired and don't work right in the daytime, many people have to get up nights. Don't neglect this condition and lose valuable, restful sleep. When disorder of kidney function permits poisonous

When disorder of kidney function permits poisonous matter to remain in your blood, it may also cause nagging backache, rheumatss pains, leg pains, loss of pepand energy, swelling, puffiness under the eyes, head-aches and dissiness.

Don't wait! Ask your druggist for Doan's Pills, used specessfully by millions for over 40 years. They give happy relief and will belp the 15 miles of kidney tubes flush out potsonous waste from your blood. Get Doan's Pills.



Figures Ohms, Watts, Amperes Volts . . . Quickly ! Any Ohm's Law Problem solved with one setting

of slide. All values direct reading. (41/2"x 9") Send only 10c in coin to cover cost of hundling.

OHMITE MFG. CO., 4842 Floorway St., Chicago 44, III.



Real Estate

predicted Big-pay permanent John of your own 6-pendi busi hese Sularies up to \$2.500 to \$70,000 a year is properly man-

icana, manuacre, building Many coake foctuare selecter real ratain. Thousands of trained core, warner, required yearly by ries, estate ficms, insucance computers, baths, Fredrik ages-ries flush past card for 32 past QUIE BOOK confed FRFE with for driets so ber and on F I so once library MODERN REAL ESTATE FRACTICE! Lone Books, Oost, C-9, 106 Estat Objo 6t., Chrong II, Illinois,



NYTHE BOX

FREE

BOOK!

Today, order U-Make-It Lamp Kill \$1 You get all parts for beautiful 24" tamp; complete, easy to assemble. Enclose check or money grader,

OSTO HORBY-CRAFTS PLASTICS COMP



Upen for yourself new world opportunities with another language by LINGUAPHON



INGUAPHONE Conversational METHOD

prepares you, in your new home, to SPEAK any one of 29 world-increases:

SPANISH GERMAN POLISM PORTUGUESE RUSSIAN ITALIAN MORWEGIAN PRENCH SWEDISH and 20 other languages

You learn through natural, everyday conversation. First you LISTEN to the clear voices of native teachers ... they speak to you as often as you wish. You REPEAT what they say ... ask and answer questions, and before you are

scrually aware, you are conversing. Endorsed by leading educators, used in rhousands of schools and colleges, and by Army, Navy, Flying, Signal and other Services. "Lenguaphone is unique... if has no squal."

SEND FOR PREE BOOK, Save time, work and money-become a two-language man.

LINGUAPHONE INSTITUTE

LINGUAPHONE INSTITUTE 58ARCA Bldg., New York 20, N.Y. Without cost or obligation please send me the Linguaphone Book. Csty State. Zone.... State. Language interested

When Writing Advertisers Please Mention Popular Science Monthly

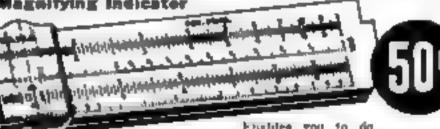
w Accurate 10"

and the planting of the The transfer of the state of th SPECIAL COMBINATION OFF

Statebar, 107 St de Bute and Instruction Book, Porket Calculator for adding and subtracting up to 999 999, 6" Transparent

Protector and Graph Hule g advanted to centimeters and Inches —ALL 3 for \$1.00 cash .51 IS Foreign: POSTPAID New "TRIG" 10" Slide Rule, with Pocket Calculator and Transparent Protractor, \$1.50 (\$1.45 Foreign) POSTPAID.

Magnifying Indicator



Enables you to do

difficult ensembly beautiff without paper or penets multiplying proportions, division, extracting roots, ate Accurate, white computation face. Has standard A. B. (D. Cl. and h process.

For complete outfit, including side rule 28-page dissipated in-struction book carrying case stud 50¢ (65¢ Foreign) New "TRID" 10" Side Rule, with same als acutes as above plus 3. L. and T see et on Reverse of S de for problems in Trigogometer; (Jumpstal Finish Indicator complete Instructions \$1.00 \$1.15 Foreign Finish Indicator complete instructions \$1.00 \$1.15 Foreign Maked postpaid Satisfaction Guaranteed or money refunded 15ee Special Combination Offee) Order NOW

HEWIG CO., Box P-143, Grand Costral Ames, New York City

Announcing-A New Drill Press Accessory

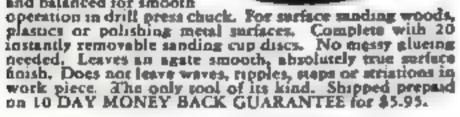
\$5.35

MALE LAND

THE BARRON ROTARY SURFACE SANDER

Nate these Special

Footures—Made of Alcos aluminum. Machined and balanced for smooth





The IMPROVED Barron Multi-Purpose Drill Press Planer...

Not only surface planes toughest woods and plastics to precision

timits had rabbets, rous, teaons, panels, grooves, beads. Will
cut rabbets, tenons, panels, etc. to a depth of 1' with
special Barron extra long hi-speed cutter blades. Thousands now in use, Made of Alcos aluminum, machine
finished thru-out. Vibrationless. Fits any drill press,
Shipped prepaid on 10 DAY MONEY BACK GUARANTEE on receipt of cash, money order or C.O.D. for \$7.50,

Buron ALL-METAL Auxiliary DRILL PRESS Table.. 18.05



Hard Alcos aluminum die canting heavily ribbed-machined both sides. Has 234 sq. inch extra large working surface. Equipped with Barron Steel Planer Fence. Can also be used for shaper operations, tonumerable other drill press uses. A real buy at \$8.85, express collect.

See Your DEALER . . . Or Write For CATALOG BARRON TOOL CO., INCOMPRESSES 370 Azekitosta Bida.

When Writing Advertisers Please Mention Popular Science Monthly



EVERTEL LOSSINTE LOSLAND DEFLARED VERGEED-TGL ROAL ORDER Letest Medel BENJAMIN AIR RIFLES and AIR PISTOLS AT ONCH. Sand for our PREE ILLUSTRATED FOLDER and complete specifiastions TODAY BENJAMIN E-C PELLETS ARE AVAILABLE.

BENJAMIN AIR RIFLE CO.FII MARION ST., ST. LOUIS 4, MO.



ALBERT CONSTANTINE & SON, 1965. 193-8 LIBOR STREET, NEW YORK 84, 11, Y.

PROTECT valuable tools from threes and look between Electic Elrher BTHNS your name any design, permanently no tools, instruments, dog colors, any mela Rasyl Simple as writing with sen at sence Hugh adder today supply imited no more when adder today supply imited no more when adder today supply imited no more when a three are gone farmed no Money? Pay material II.10 plus few copts postage on de svery Lac 6 days mobey back if but delighted. Stocker Extree, Dept. A-802, farador Ave., Cincinnati, 0.

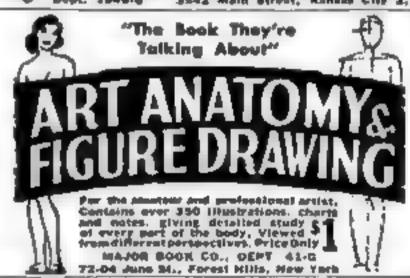


AMERICA'S PINCET L NO OF LINTWEIGHT ELECTRIC

FOR COLUMN IN FACTORS AND HARRY SHEET IT TOUR BEALER WOLL HOT GARRY WRITE KILBOR MARUTACTURING DE CHITRAL TOWER MR FRANCISCO 2, ENLIFERNIA

BELBAW MODELS IN oracee, lett.

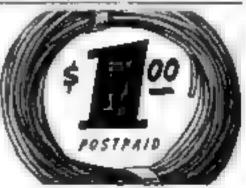
lengths Palented Mechanical People of State of Worders and post two days are tracted up to days of our commercial sawing Pays for Jac 1 Gutchiy Head post card today for Fift Phone et Ruis To Make Largher and Catalog of Wondworking Egippenent, State of State of





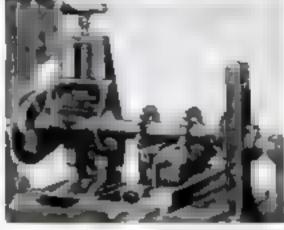
High quality stranded No. 20 Wire for bookup, ground, lead-in etc. e Vinvite insulation strips off easily Waterproof and oil-Our price is only a fraction of the actual value of this dandy Flexible Viny ite insulation strips off easily proof Our price is only a fraction of the actual value of this dandy were obtained through a manufacturer's cancellation. ACT NOW! (Free Catalogs on request.)

Clay this ad, westy your name and oddress in margin, Mail with \$1 to OLSON RADIO WAREHOUSE, 73-K Mill St., Akron, Ohio



LATHE OWNERS PRECISION MILLING MACHINE:





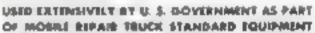
Cowing a traction at much as a standard miller the Cibbe camperform practically and milling operation subgrature. Little motion brough beautiful as the source of moves and employing at the spends and freely in he paths.

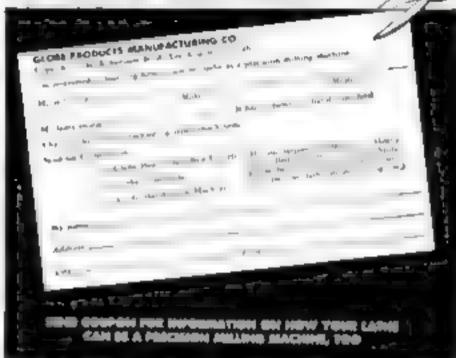
Cong Jirling Jaring Compa Sign Conting — ung M Carring Raymaya Milling

-und Hany Other Milling

INIM BEASE IVITOMOTUE

A particular resource of form or entire or quarter than with the Große 54 tax. The country of trains and sourcego as broke distance of a majority of the country has been particularly to the country between the country to the first particularly scalar.





GLOBE PRODUCTS MANUFACTURING CO

CASTING RODS and FLY RODS

IMMEDIATE

DELIVERY.

NO

PRIORITY

Make your own with our plans and arabinum offset handle
Plans \$1 Handle \$5 Cork Grip 50c
Line Quide Tip 50c Line Quide 25c NEW
a rigid Tubular Casting Rod with line guides on
the inside (like cut) \$12.50. Also 10 foot Tubular
Still-Pishing Pole with offset handle, \$12.50 TaperSiter Casting Rod with line guides and offset handle \$18.95
--cash, or pay postmen few cents extra if ordered C O D.

Order fisses this ad

BISHOFF MFG. CO.

Dept. E. 9535 Ohia St., Detroit 4, Mich.

DURAPOINT DRILLS FOR GLASS, HARDENED STEEL

Style 3 (Standard in arres aver No)





PRICE LIST

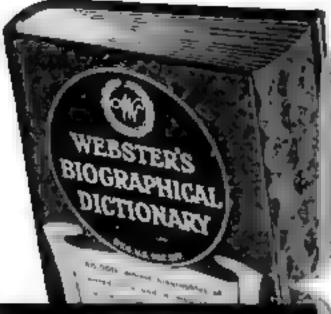
Diam-	Met	Quer all	SHANE		Dies	Not	Over old	BHANK	
eler-	Eura	(A)	Diameter	Lougeth.	elet	Each	CA)	Disnecter Length	
46"	\$ 2.75 2.75	3	7 64"	112"	86	6 4 50	5.	3 I L6 or 12	•
2 16	2 75	3.4	7 64 11 64	175	21 30	5 00 5 25	7	2a, 7 16 or 12	
14	3 00 2 75	415	11 84 7 32	112	35	5 50 5 75	6	7 16. 12 or 2h 2	
S. 16	3 00	6	14 or 9 33	115	13,10	6 25	5	15. 3a or 11 16 2	
96	3 25	6	6 or # 37	115		7 00 7 25	6	1 ₂ , 5 ₈ or 3 ₄ 2	
7/16	3 50	7	or 5 16	122	39"	7 75	18	14. 15. 24 or 13 td" 2	
	3 50	š	14. D 10 OF 28	134	15, 16	9 20	10	12, 3s. 24 or 13 16 2	
930	4 00	8	14 5 16 3 or 7 16	334	1	9 50 11 00	10	15. 3h. 34 or 13/18 2	
P/16	4 25	6	2s. T 16 or 2g	2 "	1	11 50	12	19. 8g. 74 or 7a 3	

Sizes up to 114" obtainable at proportionate cost

Druls in 64ths and 31nds now in stock, tolerance normally + 005 - 000; tolerance of 001 for 5% extra, tolerance of 0014 on special order Please do not order closer tolerance than you need. Drills below 14" on special order All drills from 14" to 1" not listed made at the price of the size next larger. Specify your largest church size

Durapoint Glass Cutter, like a pencil, better than a wheel cutter for circular cutting. \$2.50, Postpald.

DURAPOINT TOOL COMPANY, 4342 UMATILLA STREET, DEPT. S, DENVER 11, COLORADO



AN entirely new work by the famed editorial staff of Webster's New Infernational Dictionary, Second Edition. Contains more than 40,000 concise biographies, with pronunciation of names etatesman, explorers, writers, painters, actors, radio personalities, eminent figuses from every other field of activity WESSTER'S BEOGRAPHICAL DICTIONARY is an invaluable source of information for writers, speakers, and readers, 1,736 pages, thumb index, \$6.50. At your bookdealer, or from the publishers.

and all emential facts. Includes scientists,

G. & C. MERRIAM COMPANY 513 Federal St., Springfield 7, Moss.

At Your Finger Tips---Essentiat **Facts** About 40,000 HOTED MEN AND

Materical Continuencery -Iron Every Country and Every Floke of Deman

WOMEN



pumps, water heaters, economizers,

NEW FROM COVER TO COVER!

JUST PUBLISHED-For An Engineers, Firemen, Water Tendem. Oilers, Operators, Repair Men and Applicants for Engipeers' License Examinations.

A Complete Steam Engineers'
(Arrey in One Book)
1800 PAGES ES CHAPTERS
1700 ELUSTRATIONS.PULL MOCK

FACTS AT YOUR FINGER ENDS! PRACTICAL INFORMATION M MANDY FORM FEATURING: Basic principles of Steam Englneering, Including Boller Construction, Operation and Reputes. Gives practical intermetion on: Botler Calculations, fuels, feed

water treatment injectors, traps, draught, safety valves, oil burners, stokers, condensers, ejectors, cooling towers, evaporators, stram and hot water heating, pipe fitting & tubing. Contains complete data on all types of Stram Engines and Turbines, In-COMPLETE Hoists, Gas and Dissel Engine Operation, Lubrication.

Get this information for yearself— ASK TO SEE IT—Meil compon today!

AUDEL, Publishers: 49 W. 23 St., New York 10, N.Y. Mail AUDELS Power Plant Engineers Guide (Price \$4) on 7 days free trial. If O K I will remai \$1 in 7 days and \$1 monthly until \$4 is paid. Otherwise, I will return it.

Name	
Address	
Occupation	
Employed by	P B.M.





Reary 10% Solid Gold Souvenir Service Ring of World War II. A beautiful and authentic sing that your serv co man will be proud to wese and cherish for Veteran of our Armed Forces of World War II One side of ring shows Allied Flage and World with Shield ather elds shows the Great Seal of the U. S. State ring sine.



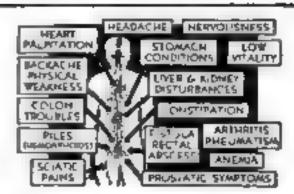
No. 1505 Esch \$18.00 Plus 10% Fed Tax Sens for Circular of Service Jewelry. Reliable Representatives Wanted,

EDWIM W. LAHE CO., Bopt. PS, 32 W. Remoulph St., Chicago 1,





FISTULA PREE BOOK—Explains Pacts



Fistula, Rectal Abscess, Piles and other rectal and colon disorders are dangerous. A new 40-page FREE BOOK explains corrective treatment Write today Thornton & Minor Clinic, Suite 949, 926 McGee St., Kansas City, Mo.

SENSATION OF THE DAY-and night!

Powerful... striking in design ... built to specifications of U. S. Air Forces , . . 3-cell flookEght throws a bears opproximately 500 fast. Durable of plastic case. Uses standard "D" size batteries.

May be carried on finger. hung an hook or belt, stood on floor. Weight only 4 cas. without batteries. Threeposition switch: steady, signal and safety. Ploted reflector.



Write for our attraction

RANAY CO. Popt. Ed 27

OO Starts you in a business of your own . . Address post turns

With the quantity

Earn big profits at home salvertising gargroun ury, Christmas Carde and name tards at money saving prices, Statemery sells at \$1.69 Box, Costs you \$1.00 Eak, Send \$1.00 today for 100 clever mailing cards imprinted with your name and address plus complete improcions for starting a mail order stationery business, Frenched terrilory available, Write Org. 30

V. IL PETERS & ASSOCIATES, Printers, TROY, OHIO



Here's the NEW

R-Y-T-O-N

SELF-ADJUSTABLE WRIST WATCH BAND (Patenta Pending)

On or off your wrist in a july it's crystal-ciser Plastic always rican and sanitary. Try it for ten days on a MONEY BACK GUARANTEE! Price 21 50 narb, with stainless steel fittings, and with gold plated fittings, \$2.00 each; post paid.

GENERAL UTILITIES (PLASTIC

and INITIALED PHOTO

Dely \$1.85 complete PLAST O'S RAFT Ring Ritt comthe na compared material fat the sense for making II has full a settle the in an enter place of the settle place of the settle

13401 Cerise Ave., Hawthorne, Catif.



Post War Models now available. Most complete line of we ding machines. Any size for any thop. From \$20 to \$200.

Brazing, preheating, cutting, spot welding, are soldering, pipe thawing,

220, 110, 32 Volt Models

UNCONDITIONALLY GUARANTEED

Highest grade of moterials used in construction.

There is a Forney Product in every town in the U.S.A. Also have used Welders.

Write or wire. factory direct,

FORNEY MFG. CO., FT. COLLINS, COLO.

ENJOY and PROFIT by THIS BOOK of over 100 ITEMS ONLY NAME AT JOSÉ SIMPLE PLANS for PRACTICAL PROJECTS You will have no trouble in working out the plans de-HALP PLANTS and you will get a lot of enloymout from them Whether or not you are mechanically inclined, the projects in these pians will Chesafors appeal to you for their use-fulness and practicability. They will save you money ELECT CA SIME and make money for you, too in jobs and repairs for neighbors and friends, because the plans embody all

NO EXPENSIVE TOOLS MEEDED

a nds of electrical de-

The tools you have ground the house are all you need for these projects and most of the necessary material

can be found around workshops, garages and scrap yards. Being able to make your own we der he.ps a lot in doing other jobs, and the LeJay Manual shows

you how easy it is to do this, also, how to make over 100 d ferent items . three days trial-money back it not satisfied. Only \$1.50 Canada, \$1.75.

THE NEW MODERN LEJAY FAST-FREEZER PLANS FROZEN STORAGE \$1.09

ELECTRIC

OUT-BOARD

ELLI TRIC

SCOOTER

For Fish, Steat, Fruit, etc. From 8" above to 10" befour yers.

MOTORS

S SIZES-II to 40 Cubic Foot Copecity

MO KNOWLEDGE OF REFRIGERATION

-Plans are easy to follow and you may have much of the material at band, FAST FREEZERS made from these plans bave been in use since 1938.



MILH COOLER PL are included at no extra cost Syrd on y \$1 00 for the FAST FREEZER pens—or save 25c and send \$2 25 for both those pleas and the LeJay Manual.

723 LaJay Building,

NNEAPOLIS - B - MINN



In any type of homeeraft, there's no limit to the things you can do with Durham's Rock-Hard Water Putty, the modern powdered plastic, Molds fascinating figures. Fills chipped places in antiques. Makes lasting repairs in wood, plaster, tile or nux with water, and it's ready to use. Hardens quicklythen you can saw it, chisel it, paint it.

Most patching materials may shrink, chip off or fall out. But Darham's Rock Hard Water Putty does not shrink. It sticks and stays put. Order from your lumber, hard-

ware or paint dealer.

SPECIAL — 4 lb. can only:

To home confirmen, we will send the big 4pound can, postpaid anywhere in U. S., for only antee complete satisfaction or reland every cent of your poney, Order today, Donald Durham Co., 240 Schoo, St., Des Moines, Iowa.

MONEY-SAVING OFFER-ORDER NOW





Are you a square per in a round hole unhappy at home, or in your work? For more than 15 years I have been helping men and women find themselves, their talent possibilities, aptitudes and handicaps. If you are discontented at home or at work send for "What About Your Future", which may give you a new alent on your future happings and auccess. It is new slant on your future happiness and success. It is FREE. Dr. Bunker (2), Joplin, Mo.

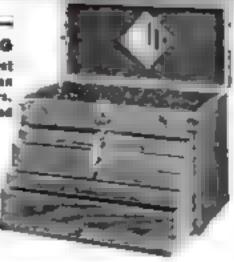
> When Writing Advertisers Please Mention Popular Science Monthly

PROUD of your TOOLS?: KEEP, them in a SCHERR CHEST

SERVICE ARLE -ENDURING

In opun top cheet 2019 : 13% - 1674R hand-fitted drawers. **Built of Lila dried** oak with block Buish hardware, Within any mephanis's budget

S13.50



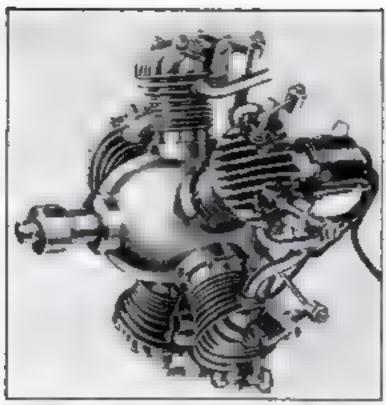
A mechanic is known not only by his tools, but by the way he keeps them. Skilled mechanics keep their tools corefully, in well-ordered chests. A really fine tool-chest is a lifetime possession. Il pays la gel a good one. Here are two of the Scherr line, which offers a wide choice of chests at various prices, all built to last and carefully designed to ideally serve the enachinist's need.

Shipped immediately C O D., or on receipt of check or money order. Bulletin with specifications on full line, at request.

The DE LUXE CHEST -Balled gatt. with tray 100, ZOXE14 I W D I HCK 1. Fine facquer finish. Elevan felt-Need drawers, laciading vertical drawer for drills. The ultimate in tool chests.4



COMPANY, Inc. - 200-PS LAFAYETTE



Not Just A Model Airpiane Engine . . . But a REAL AIRPLANE ENGINE Built in MINIATURE!

Every part of this marrelous little 5-cylinder engine is built just like the big onest it is a REAL arrivate culine built in miniature. The Morton M.5 Radial Engine, is PRECISION BITLE throughout, with hardened ground steel electer, cast in alumnum colliners. Pistons lapped in industrial cylinders, theorems perfect fit and masimum compression Valves are made of special steel and sent in reviscostic valve cages. Crank shaft and lead gear are mounted in three New Departure ball, bearings Carburetor has both high and low speed his, and will like or take the throttle same as a full-sized engine. This exetting little engine, weighing only 22 ors, and developing approximately ONE HALF II P. at 3 500 R P M, will emble you, for the first time to build a gas-model plane that LOUKB and FLIES like the real thing.

Also For The FIRST TIME . . . 2 & 3 BLADED AH-Metal, ADJUSTABLE PITCH PROPELLERS!

Morton Adjustable Pitch Propellers can be used with any model greeilne engine Send Life for Himstrated detailed folder on M.5 Engine and Accessories, including Assembly Chart.

MORTON AIRCRAFT CORPORATION, Dept. C100 3227 Harney Street, Denka 2, Hebreska



ATTENTION!

ORGANIZERS - DISTRICT MANAGERS

The Original
War Surplus Reporter

UP TO S100 DAY

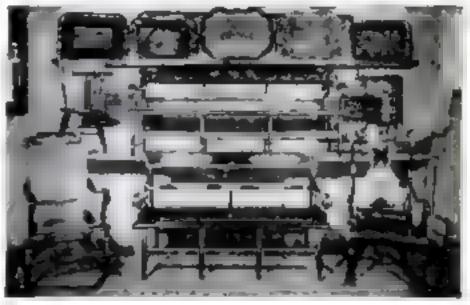
requires the full time service of high grade executive type seleamen in a. states Sensationally different plan of sales promot on secures up to 5.00 day results. Contacts with business and industry on y-by direct leads only if your idea of success in selling is up to \$100 a day EVERY day, then wire or write quickly to

EXECUTIVE OFFICES

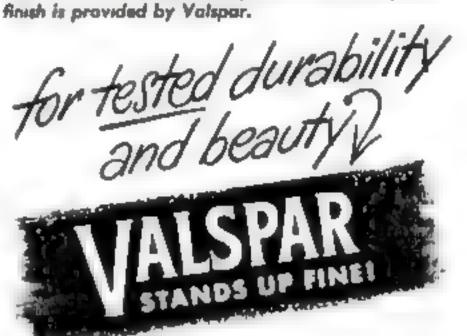
THE WAR SURPLUS REPORTER

20 E. JACKSON, DEPT. 502, CHICAGO, ILL.

for treasured heirlooms?



Priceless antiques restored by Ira Ebersole famous decorator of Chambersburg, Pa. The oil-important finish is provided by Valspar.



Whether it's the furniture you prize most, or just the floors which the youngsters have scraped in their playing—your home deserves Valspar. Even when boiling water is poured on it, Valspar never turns white. In addition, Valspar enhances the beauty of the finish.



Remember, Valspar stands up fine! And that means Valspar paints and enamels as well as the famous Super Valspar Varnish. Always specify Valspar.

VALSPAR PAINTS - VARNISHES - ENAMELS

VALENTINE & CO., INC., 11 E, 36th St., New York, N. Y.

Buy War Savings Bands and Stamps regularly.

GET THE IMPROVED SUPER DRILL GRINDING ATTACHMEN Sharpens round shank drills from 3/32" to 1-1/14" diameter. Grinds old, broken Drill after granding or dull drills like now in four accurate drill paint angles - 49" - 59" - 69" - 88" RECESSED ANGLE GUIDES FLIMINATE MEED FOR PROTRACTOR Grinds short, medium and long twist drills from 1-1/2" up to 11". Attaches to bench or grinder - equally suited for hand at power-operated grinding wheels. Pays for

--- Quaranteed To Do The Work or Money Refunded

69" and streetwee of the party of the Person for long drille

itself the Brst week. The Grinding Fixture That Gives Rounded Points! USED BY ARMY - MAYY - AMECRAFT PLANTS 60.000 New In Use! Wherever Brills are Needed!

The period of drift grinding Anyone can be an expect from the start with the larger Greater This precision former gives a love carrier, and channels desired Union work that the highest provide grader Great drift in 21 security. Since field, tone and money Body for long hard using FOUR ANGLE PEATURE GIVES PROPER POINT TAPERS FOR CLEAN PAST DESCRIPTION STEEL, WOOD OR PLASTIC PRODUCTE his factory, purchase along home merbelong or report play thought to wishout the same Drift Greater Delivering with properties outstracture.

The Super Point Greater Delivering with property outstracture.

Mail pour effects or tenuny desire for only \$2.75 with your provided abliers. The Super Greater will quote by \$1512 W. Slowson Ave. Dopt. FR-16

Les Angeles 44, Calif.

W IN THE DA

The amazing new ACNDER GLO Jumihe a post who have a common of the general shrings of the same and the same has been a shring and the same has been and the same and the same has been a same Corners arrange with above or the series leads Se SEY Chen the habit to be on a Sacto of the partition of the parti 481-Q, 238 N. Michigan Ave, Dept. Chicago 1, Ill.

Adjustment 20



VALUABLE EQUIPMEN

New yes and existly and really come root from plost, tree, phousing, support elementate and nichel. Cleans report and assertain from plots, from photomorp, they're, obtained and and interest on the first process of the process of anything on the first process on the first process of the process of



Per Postage And Its Grand Team Mate CITIES SERVICE

Got old of rust. 44th REEF CO ASSAUL Crops Service Anni-Currade Stome not yet of the late of the party of the part



1 gal. — \$1.75

YOUR OLDER WILL BE SETPEND PO



Special	Order	Di	yhios	ie .				
Cities S	errica	OH	Č0.,	401 B	ow York	i fore,	Treates,	8. 4.
I enclose	ebreit.	BF	00000	ordes	Jur \$		Plea	o semi

NAME
ADDRESS



SHIP MODEL MAKING

New book shows how to make any model. Shows the phore curs to ake tome agoing methods of expects. Complete plans for gorgeous guitane, c tipper able etc. Almost 100 a leaten lone. Munthly, Deat. 15, 353 Fourth Ave., New York.

WOMEN OF THE PARTY.

WONDERS THROUGH THE MICROSCOLE broads 192 pages I where g facts and feliphranting heat will new to letter want a de dade democal for accroscope facis. This book fells you how to

ler's or leaton time of the () The tuscopic consists of what instruments and accessorres you will need and how vol can move them from could be opposed assume.

It tells you now to use your equipment, how to secure and preserve specimens, take photomicrographs, how to do dissecting and prepare cultures. It shows the beginner where to look for subjects, and how to discover new and exciting worlds in the most common objects. Over 100 illustrations. Mail the coupon below today for your copy. Satisfaction guaranteed or money back.

SEND NO MONEY NOW!

To examine your copy of this fascinating book you needn't send a penny. Just mail the free examination coupon below, today and examine the book for 10 days.

TI DOL MICESOS	en, money will be refulfied.
POPULAR 353 Fourth	IL THIS COUPON TODAY! SCIENCE MONTHLY, Bupt. 98 Ave., New York, New York
I will pay You guaran	me WONDERS THROUGH THE MICROSCOPE. postman only \$1 00 plus postage on delivery see complete satisfaction or I may return book for full refund.
NAME	
ADDRESS	
CITY	STATE

JOU A DYNAMIC HEAVY DUT INDUSTRIAL WELDER FOR ONLY

TO SAVE YOU VALUABLE TIME and MONEY!

Designed to Do High-Grade Welding Inexpensively

Maintenance men, farmers, mechanics, machine shops, foundries, auto, general repair and job welding shops using the DYNAMIC WELDER find it so indispensable and useful that they cannot afford to be without it. If inexperienced you can easily learn to do a variety of highgrade welding jobs by following the practical, simplified operating and welding instructions furnished.

WORKS ON IRON, STEEL, BRASS, BRONZE and OTHER METALS

Has eight metallic and carbon arc welding heat stages. Does work you would think only possible with a larger, more expensive machine.

READ WHAT USERS SAY...

Repair Shop Owner says, "It will do more than you say"

"I want to say I operate a repair garage and am more than satisfied with the welder. It will do more than you say." C. P., Butler, Oblo

It's the Greatest Portable Outfit

"Now I am equipped for all kinds of welding and I must say it's the greatget portable authit for welding any man could ever wish to own. I wouldn't sell mine for the cost of plenty welders I have seen which were very high in cost but not in convenience. You may put me on file as a booster of your wonderful welding product." W. J. B., St. John, N. B., Canada

Better Than I Expected

"I have done quite a little welding with my welder and will say it is better than I expected. The price, convenience, and variety of work that can be done with the Dynamic are the attractive points." W. R. P., Fortland, Ore,

EASY TO OPERATE!

DYNAMIC SUPERCHARGED WELDER

GET DETAILS ON OUR 10-DAY TRIAL OFFER!

Once you see a DYNAMIC in operation you won't want to be without it. Its simplicity will amaze you. In a year the DYNAMIC only costs you about 6c a day. Comes complete, ready to operate, with helmet, rods, cables, electrade holder and operating instructions, etc. Nothing else to buy. Write today for free priority assistance and particulars on how to qualify for one of these amaz ingly low-priced welders. Act now while they are still available.

DYNAMIC WELDER CO.

13 East 23rd, Street—DD

CHICAGO 16, ILLINDIS

SEPTEMBER, 1945

Buy War Savings Bonds and Stamps regularly.

City (1) The Hatte M

COMPLETE

AMAZINGLY SIMPLE

TO OPERATE!

This portable Dynamic

Welder, easily carried right to the job, can be

operated from any con-

venient properly wired 110 Volt 60 cycle

line. Can also be

supplied for 220

Volt 60 cycle operation and far oth-

er voltages and

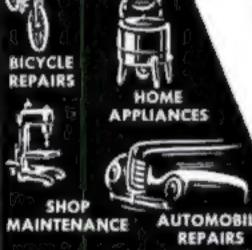
cost.

cycles at slight,

odditional





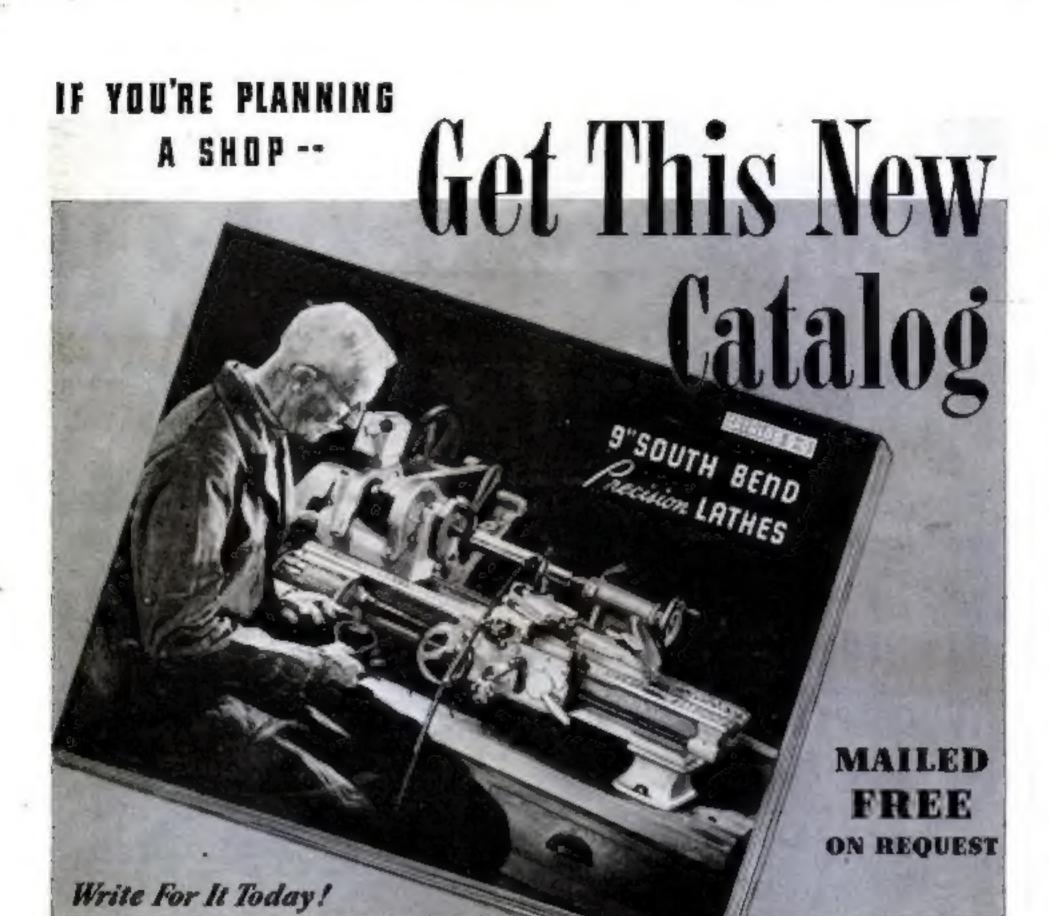












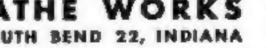
Every man who owns or plans to build a shop will want this new 36-page catalog. All models of South Bend 9-inch Precision Lathes are shown in color. Complete specifications, including capacities, speeds, feeds, and weights, are printed opposite the illustration of each lathe. Practical attachments and accessories are also shown.

The South Bend 9-inch Lathe is a precision tool, designed and built for fine machine work -in steel, cast iron, bronze, tool steel, fibre, plastics, bakelite and similar materials. It's the very heart of the well-planned shop. Write today for Catalog 9-G.

LARGER SIZES OF SOUTH BEND LATHES

South Bend Engine Lathes and Toolroom Lather are available with 10", 13", 14%, and 16° swings. Precision Turret Lathes are made with 1/4" and 1" collet expecition, Information supplied on request, specify size of lathe in which you are interested.

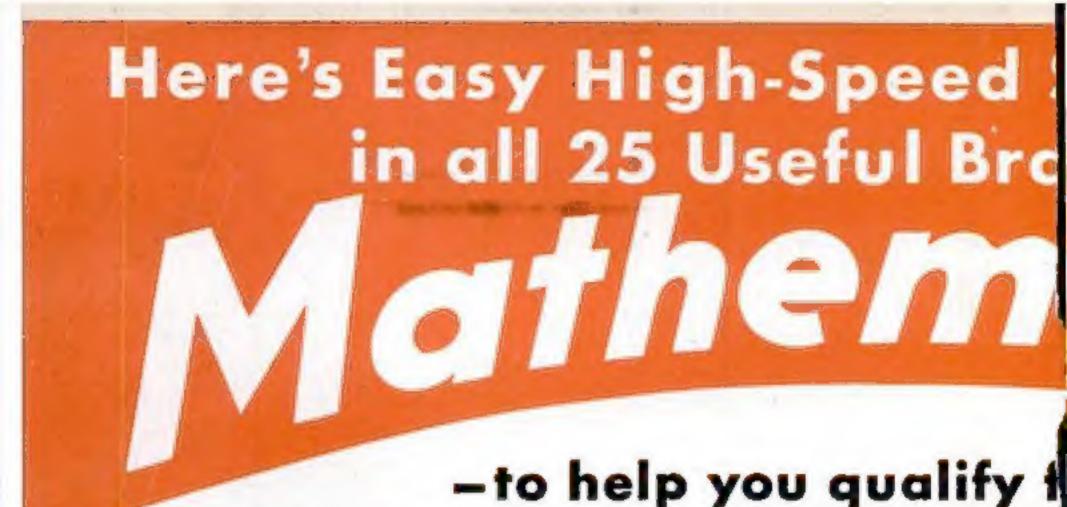
Lathe Builders For 38 Yours







Copyrighted Interest



Brought to You by 28 Leading Experts from Columbia, M.I.T., Cornell, Carnegie Tech., Georgia Tech., many others! A Practical Mathematics Course in Four Volumes! Used by Over 100,000 Men in Shop and Office!

> See List of Subjects and Instructors

on Outside Flap of This Cover

CLIMAXING its achievements in adult education, the NATIONAL EDUCATIONAL ALLIANCE DOW announces a new streamlined Course in Mathematics especially designed to answer the thousands of urgent war and post-war calls for mathematically trained men in virtually EVERY field!

On work bench, in drafting room; in the laboratory; in tool die and pattern making; in

construction and engineering of all kinds; there's hardly a field where a mathematically trained man hasn't a decided advantage. He gets the better job—bigger pay—earns promotion more quickly—and will come out ahead in the post-war change-over to peacetime industry.

This New N. E. A. Course in Contraction of the contraction industry.

This New N. E. A. Course in Mathematics makes it possible for the average person to acquire—in

only a few months—a practical working knowledge of all 25 branches of methematics and their practical applications. It comes to you complete in four volumes filled with Illustrated fuscinating lessons designed for home study.

You receive instruction from 28 foremost instructi

instructors chosen from outstanding universities. Each instructor has been selected be-cause of his special knowledge of a particular branch of mathematics and because of his ability to simplify and streamline his in-structions.

Over 600 Helpful, Graphic Pictures and Diagrams! Nearly 1300 Pages!

No previous mathematics knowledge is needed under this ingenious teaching plan. You start with Basic Arithmetic and proceed by easy stages to an understanding of the most advanced branches of mathematics.

You'll learn how to use Algebra for short

cuts in daily shop problems, in construction work, in tool and die making, in welding, sheet metal work and pattern making, in office and laboratory. You'll learn how to apply Geometry in chemistry, mechanics, electricity and radio, in the drafting room. You'll learn how

to employ Trigonometry in gearing, lathe centers, blueprints, die punches, etc.; in gunnery, range finding, aviation, navigation You'll learn how to utilize Calculus in the design and production of guns, planes, tanks,

jobs TODAY—and in POST-WAR

ships, dams, bridges, motors.
You'll learn Practical Applications that
you can use to win advancement and
bigger pay, now and in peacetime.

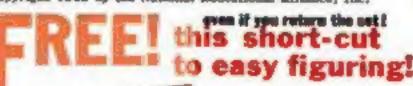
Yours for FREE TRIAL

Normally, mathematical training as comprehensive as these 25-Courses-in-1 would cost you hundreds of dollars and years of study.

Now you get it in these 4 volumes at a small fraction of the cost and time! Test this Course at our risk and expense.

Mail coupon below get the
set for a week's PREE Examination. After a week you may return it and owe nothing; however, if you are thoroughly convinced that it can help you advance to bigger earnings, keep it at the incredible bar-

gain price and easy terms shown in coupon. But you must ACT NOW! This edition has been rigidly limited by restricted paper quota. There may not be enough to meet nation-wide demand. Avoid disappointmentmail Free-Trial Coupon NOW! National Educa-tional Alliance, 37 W. 47th St., New York 19, N. Y. Copyright 1945 by the National Educational Alliance, Inc.

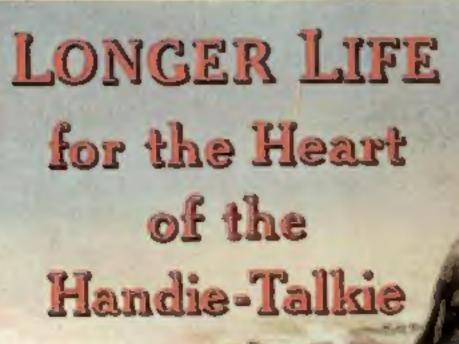


6-PLACE LOGARITHMS MARSH

Doos All the Work of a Slide Rule Factor, Engler and More Accurately! 160 Pages!

This book of Logarithms is the greatest short-cut ever devised for quick and easy multiplying, dividing and all other calculating, Easier to learn; gives answers quickly and far more accurately than any Slide Ruie. A complete explanation of the use of logarithm tables is given. So simple you can grasp it and begin to apply it in a few minutes. Covers logs for all numbers to the 6th place; contains much additional information including a table of circular arcs. Invaluable for mechanics, scientists, business men, etc. FREE even if you return the Mathematics Libraryi

MAIL THIS FREE-TRIAL-FREE GIFT COUPON TODAY



Heart of the handie-talkie is the dry battery that powers it. These days, it is a basically different battery, like the Mallory Tropical Dry Battery - originally developed by Mallory for the Signal Corps in response to the demand for a dry battery that can "take it" where conditions are the toughest.

In all norts of weather conditions the Mallory Tropical Dry Battery has proved its capacity to "take it." It gives from four to six times the life of the conventional battery it replaces. It withstands high temperatures and humidity which ruin ordinary batteries. It gives greater power with smaller size. What is more, its voltage remains substantially constant throughout operating life.

The Mallory Tropical Dry Battery needs no "rest periods," possessing the same ampere hours' servicelife whether operated intermittently or continuously, It has "shelf-life" sufficient to send it into action with full voltage output. It has done a job in providing more satisfactory performance for the handie-talkie.

Outstanding battery improvements for the handietalkie and other military equipment foreshadow similar vital betterments for many civilian products. Hearing aids and pocket radios, for instance. Urgent we have satisfied military requirements completely.

The "bandle talkie" is a front has field communications misstial. The Mallory Tropical Dry Battery designed especially for it consists of seventy-two indipidani vells, queembled in a compact tueler inch, hermetically senied connainer.

military needs have precluded the production of civilian types as all Tropical Dry Batteries now must go to the armed forces. But it seems certain that, when civilian models are available, longer operating life, smaller size and continuing "freshness" will be embodied in hearing aid batteries to greatly improve their utility and comfort to users. The realization of the much-talked-of pocket radio comes closer when these same attributes are designed into batteries that will fit the pocket as readily as a cigarette case.

He will not make promises until see our franclote promise into performance. This can happen only when

MALLORY TROPICAL* DRY BATTERIES

ELECTRONIC PRODUCTS-AND MALLORY BEARINGS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

